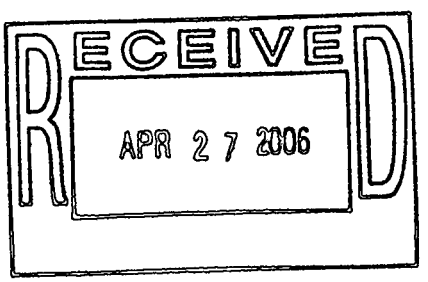
Closeout Report for IHSS Group SW-2 Original Landfill (IHSS 115) and Water Treatment Plant Backwash (IHSS 196)



November 2005

Closeout Report
for IHSS Group SW-2
Original Landfill (IHSS 115) and
Water Treatment Plant Backwash (IHSS 196)

Approval received from the Colorado Department of Public Health and Environment on

(_____).

Approval letter contained in the Administrative Record.

November 2005

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Attachment A – Construction Completion and Certification Report Accelerated Action for the Original Landfill Rocky Flats Environmental Technology Site, Text and Appendices A - L

Acronyms

AL	action level
AR	Administrative Record
CAD/ROD	Corrective Action Decision/Record of Decision
CCCR	Construction Completion and Certification Report Accelerated Action for the Original Landfill Rocky Flats Environmental Technology Site
CRA	Comprehensive Risk Assessment
cy	cubic yards
DOE	U.S. Department of Energy
DU	depleted uranium
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ft	foot or feet
FY	Fiscal Year
HRR	Historical Release Report
IA	Industrial Area
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action
kg	kilogram
K-H	Kaiser-Hill Company, L.L.C.
NFAA	No Further Accelerated Action
OLF	Original Landfill
OU	Operable Unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS or Site	Rocky Flats Environmental Technology Site
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SID	South Interceptor Ditch
SW	Southwest
TCE	trichloroethene
WRW	wildlife refuge worker

EXECUTIVE SUMMARY

This Closeout Report summarizes accelerated action activities conducted at Individual Hazardous Substance Site (IHSS) Group SW-2 at the Rocky Flats Environmental Technology Site (RFETS or Site) in Golden, Colorado. IHSS Group SW-2 consists of the Original Landfill (OLF) and the Water Treatment Plant Backwash (Filter Backwash Pond) IHSSs.

Closure of IHSS Group SW-2 was conducted in accordance with the Final Interim Measure/Interim Remedial Action (IM/IRA) for the Original Landfill (Including IHSS Group SW-2; IHSS 115, Original Landfill and IHSS 196, Filter Backwash Pond) (DOE 2005a) and with the Final Design Report and Design Calculation Documentation for the Accelerated Action for the Original Landfill at the Rocky Flats Environmental Technology Site approved by the Colorado Department of Public Health and Environment (CDPHE) on May 13, 2005 (CDPHE 2005) (DOE 2005b). Closure activities primarily included the removal of surface soil "hot spots", removal of monitoring wells, removal of an abandoned natural gas pipeline, waste regrading, re-grading of fill, buttress construction, placement of a 2-foot-thick soil cover over the entire fill area, construction of surface water berms and channels, erosion control, revegetation of disturbed areas, and installation of new monitoring wells.

Attachment A of this Closeout Report includes the Construction Completion and Certification Report (CCCR) Accelerated Action for the Original Landfill Rocky Flats Environmental Technology Site. This Closeout Report and associated documentation will be retained as part of the Rocky Flats Administrative Record (AR) file.

1.0 INTRODUCTION

This Closeout Report summarizes accelerated action activities conducted at Individual Hazardous Substance Site (IHSS) Group SW-2 at the Rocky Flats Environmental Technology Site (RFETS or Site) in Golden, Colorado. IHSS Group SW-2 consisted of the Original Landfill (OLF) and the Water Treatment Plant Backwash (Filter Backwash Pond) IHSSs.

Figure 1 shows the location of IHSS Group SW-2 and Figure 2 gives a more detailed look at the Original Landfill and the Water Treatment Plant Backwash area.

Accelerated action activities were executed as documented in the Construction Completion and Certification Report (CCCR) Accelerated Action for the Original Landfill Rocky Flats Environmental Technology Site (Attachment A). Closure activities primarily included the removal of surface soil "hot spots", removal of monitoring wells, removal of an abandoned natural gas pipeline, waste regrading, re-grading of fill, buttress construction, placement of a 2-foot-thick soil cover over the entire fill area, construction of surface water diversion berms and perimeter channels, and revegetation of disturbed areas.

Planned activities were documented in the Final Interim Measure/Interim Remedial Action (IM/IRA) for the Original Landfill (DOE 2005a) and in accordance with the Final Design Report and Design Calculation Documentation for the Accelerated Action for the Original Landfill at the Rocky Flats Environmental Technology Site approved by the Colorado Department of Public Health and Environment (CDPHE) on May 13, 2005 (CDPHE 2005) (DOE 2005b). Ecological effects will be evaluated in the ecological risk assessment portion of the Sitewide Comprehensive Risk Assessment (CRA).

Approval of this Closeout Report constitutes regulatory agency concurrence that IHSS Group SW-2, Original Landfill (IHSS 115) and Water Treatment Plant Backwash (IHSS 196) are No Further Accelerated Action (NFAA) Sites. This information and NFAA determination will be documented in the Fiscal Year (FY) 2005 (05) Annual Update for the Historical Release Report (HRR).

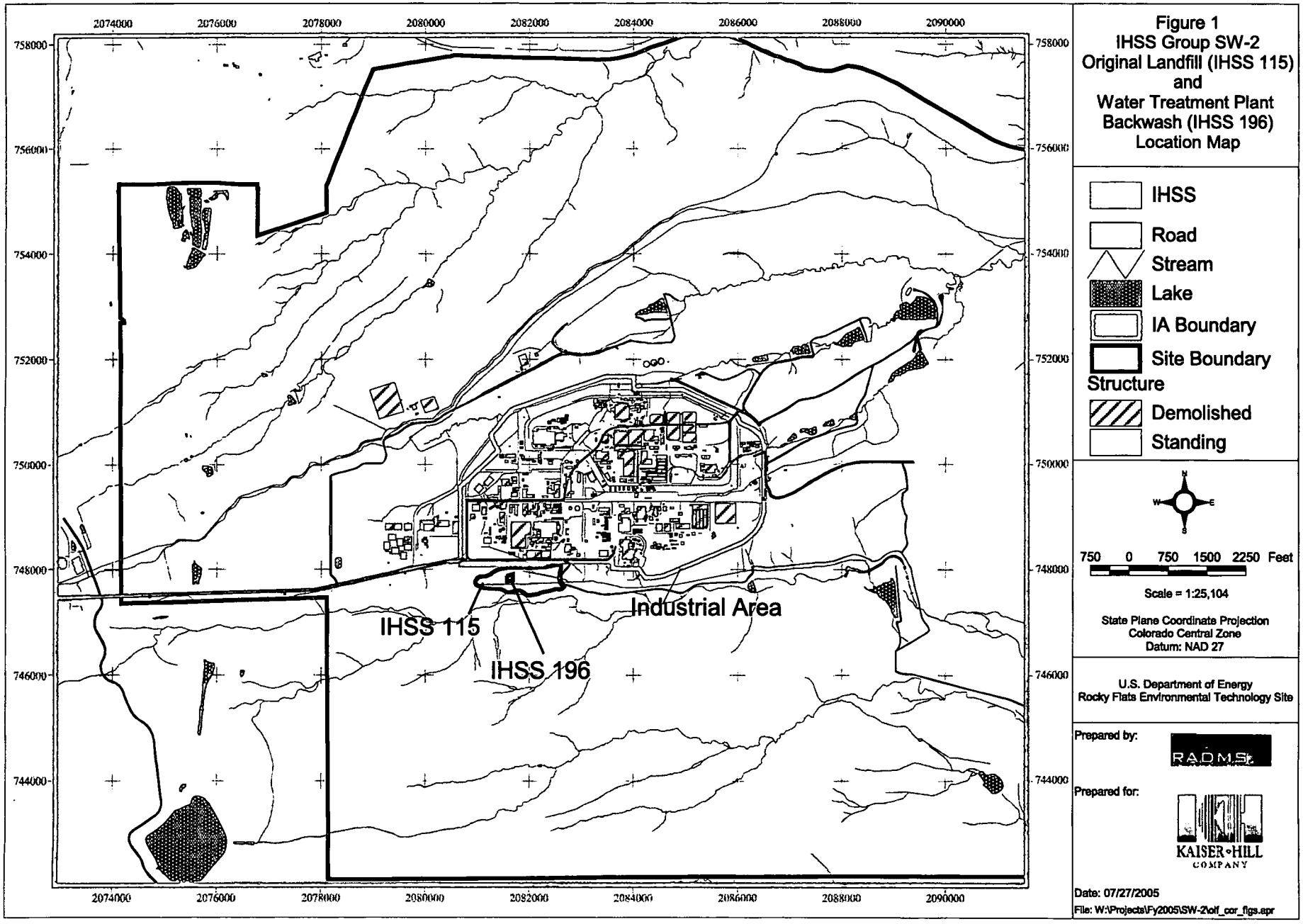

Figure 1
IHSS Group SW-2
Original Landfill (IHSS 115)
and
Water Treatment Plant
Backwash (IHSS 196)
Location Map

IHSS
Road
Stream
Lake
IA Boundary
Site Boundary

Structure
Demolished
Standing

N
W
E
S

750 0 750 1500 2250 Feet

Scale = 1:25,104

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
RADMS

Prepared for:
KAISER-HILL COMPANY

Date: 07/27/2005
File: W:\Projects\Fy2005\SW-2\olf_cor_figs.apr

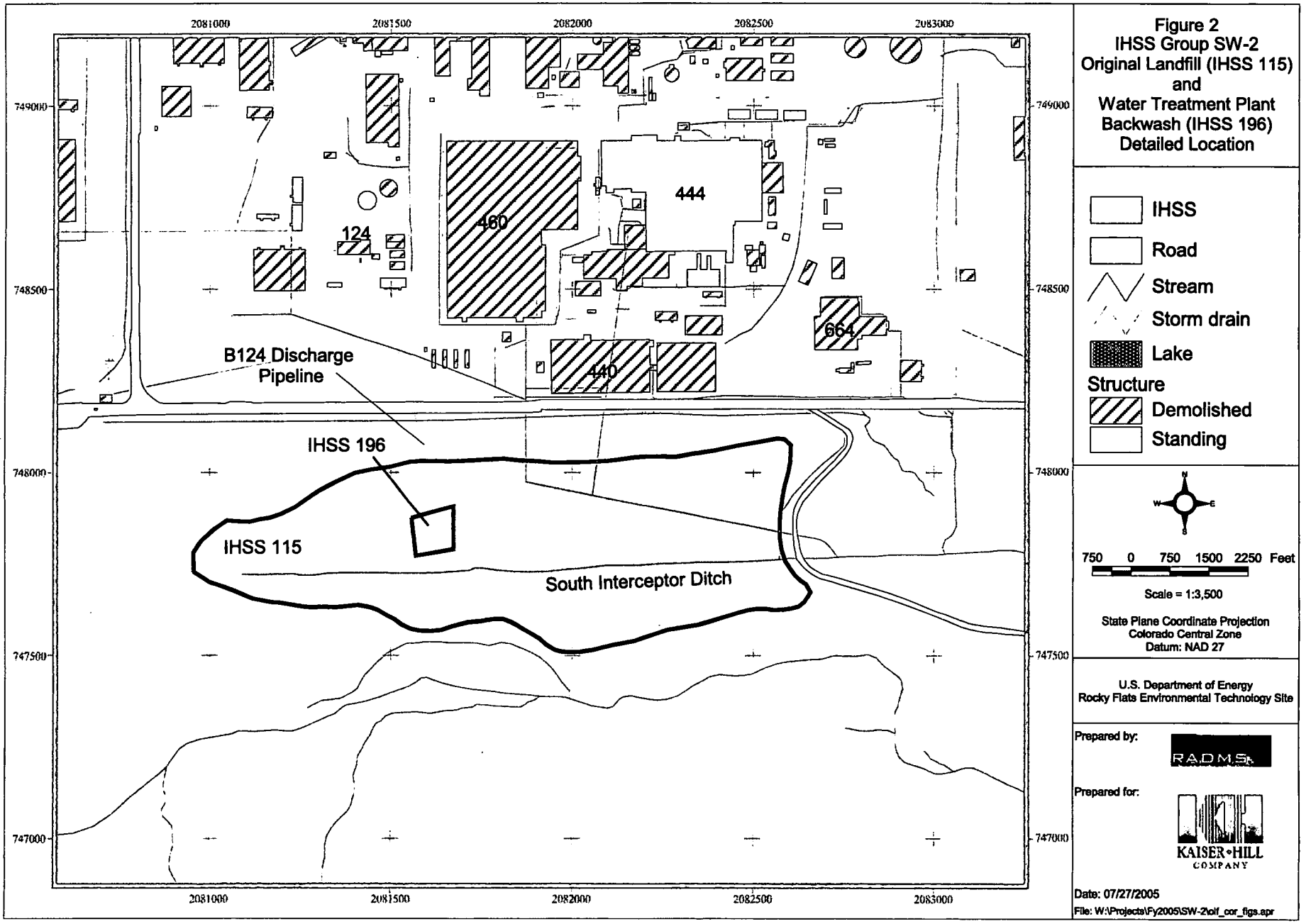

Figure 2
IHSS Group SW-2
Original Landfill (IHSS 115)
and
Water Treatment Plant
Backwash (IHSS 196)
Detailed Location

IHSS
Road
Stream
Storm drain
Lake

Structure
Demolished
Standing

N
W E
S

750 0 750 1500 2250 Feet

Scale = 1:3,500

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: RADMS

Prepared for: KAISER•HILL COMPANY

Date: 07/27/2005

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1.1 IHSS Group SW-2 Site Description and Background Information

IHSS Group SW-2 covers approximately 20 acres and includes two IHSSs: IHSS 115, the OLF, and IHSS 196, the Water Treatment Plant Backwash (Filter Backwash Pond). IHSS 115 is located south of the RFETS Industrial Area (IA) pediment on a south-facing hill slope north of Woman Creek. IHSS 196 lies approximately in the center of IHSS 115. Approximately 1,000 feet of the South Interceptor Ditch (SID), the storm drain and building footer drain discharge pipes, and other disturbed areas lie within IHSS 115. These IHSSs were formerly part of Operable Unit (OU) 5, Woman Creek Priority Drainage. An OU 5 Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) was conducted in accordance with an approved work plan; a draft final report was issued in April 1996 (DOE 1996) (DOE 2005a).

1.1.1 OLF (IHSS 115)

The OLF was used to dispose of solid sanitary and construction debris wastes generated at RFETS from 1952 to 1968. The landfill was not designed or operated as an engineered landfill. Aerial photographs indicated that the landfill was operated as a fill area. Waste was dumped in the area below and just south of the southern edge of the alluvial pediment on which the RFETS IA is located. The waste was generally spread over the south-facing hillside, serving to fill in the area below the pediment edge. No liner or other collection barrier was installed between the waste and the existing surfaces (DOE 2005a).

In the waste placement process, the waste material was mixed with soil. The volume of disposed waste and commingled soil was estimated at 160,000 cubic yards (cy). Because of the slope angle, and the geological mapping and characterization of the colluvial and weathered bedrock material making up the hillside, the hillside in this area was identified as susceptible to sliding even before the slope was covered with waste fill (DOE 2005a).

Disposal operations at the OLF ceased by the fall of 1968 possibly due to the opening of the Present Landfill (IHSS 114, located north of the IA) which began operating on August 17, 1968. The OLF waste material was covered with a soil layer after disposal operations ceased. Details on the placement of the soil cover layer, including exactly when it was constructed, are not available. Portions of the slope on the southern side of the landfill were later regraded to correct sloughing and erosion problems. Accurate and verifiable records of the wastes placed in the landfill are not available. However, approximately 74,000 cy of sanitary waste and construction debris were disposed in the landfill (DOE 1996). These types of wastes likely included relatively small quantities of organics, paint and paint thinner, oil, pesticides, and cleaners. Commonly used organics from 1952 to 1968 may have included trichloroethene (TCE), carbon tetrachloride, tetrachloroethene (PCE), petroleum distillates, 1,1,1-trichloroethane, dichloromethane, and benzene (DOE 1996). In the 1960s, the landfill may have received polychlorinated biphenyl (PCB) wastes (DOE 1992), such as carbonless copy paper, transformer and vacuum pump cleanup paper and rags, small capacitors, and fluorescent light bulbs. Metals such as beryllium, lead, and chromium, may also have been placed in the landfill (DOE 2005a).

There is no information indicating that the OLF was used for routine disposal of radioactive material or other hazardous substance waste streams. Although the OLF was not operated for management or disposal of radioactive waste, information in the HRR and characterization

results indicated that some waste contaminated with radioactive material, most notably wastes from buildings where depleted uranium (DU) operations were conducted, were disposed in the OLF. In addition, in 1965, 60 kilograms (kg) of DU were placed in the landfill after the DU, which was left on a pallet, reportedly ignited on a flatbed truck. The DU was probably covered with soil to extinguish the fire. Efforts were later made to retrieve the DU, however, only 40 kg were recovered. Further use of the affected area of the landfill was avoided. Further removal of DU in contaminated surface soil was completed in August 2004 leaving surface soil activities below the action levels (ALs) (DOE 2005a).

In 1995, geotechnical investigations were conducted at the OLF as part of the OU 5 Phase 1 RFI/RI. Several discrete landslides as well as general areas of sliding were defined during the investigation and it was concluded that landsliding is endemic to slopes underlain by claystone bedrock in the RFETS region (Metcalf & Eddy 1995). Investigators documented the fill material that was encountered. The material consisted of waste mixed with varying amounts of sandy, clayey gravel and cobbles derived from colluvium and Rocky Flats Alluvium. The waste materials in the fill included sheet metal, wood, broken glass, plastic, rubber, metal shavings, graphite sand, solid blocks of graphite, concrete, asphalt, and portions of 55-gallon steel drums. The waste fill ranged in thickness from 2 ft to over 11 ft (DOE 2005a).

A follow-up geotechnical investigation was completed in 2004 to further define the level of landfill stability and to support the accelerated action design. Results of the follow up investigation indicated no current evidence of landsliding or mass movement of the waste fill and soil; however, aerial photographs of the area prior to waste disposal suggested that the pre-landfill slope exhibited signs of previous instability and natural erosion. As of 2004, the landfill contained areas of sloughing and erosion resulting from historic landslides prior to waste placement, poor waste management practices, and erosion and subsequent slope instability caused by poor surface water controls (DOE 2005a).

Seepage emerging from the OLF after a major rainstorm in July 1986 was traced to an outfall pipe from the Building 460 footing drains. Sloughing of material in the area of the outfall occurred as a result and the hillside materials may have been washed into the SID. To prevent migration of materials, a containment embankment was constructed to prevent flow into Woman Creek. The outfall piping was also extended to the east to discharge beyond the landfill boundary (DOE 2005a).

1.1.2 Water Treatment Plant Backwash (IHSS 196)

The water treatment plant backwash (IHSS 196) was located on the hillside north of Woman Creek, approximately 800 ft south of the water supply treatment plant in Building 124. The treatment plant treated water that was delivered from the Denver Water Board reservoir and ditch system to the raw water pond located north of the West Access Road to produce the plant's potable water. The water treatment plant backwash (IHSS 196), also known as Pond 6, was used as a retention pond to allow sampling of filter backwash water. It was also described as an evaporation and settling pond. There is no record of sludge or sediment removal from the pond (DOE 1992).

Pond 6 was constructed in 1955. However, water from the water treatment plant was discharged at the OLF before the pond was constructed. The Original 1992 HRR (DOE

1992) refers to an October 1954 reference that indicated backwash water from the water treatment plant flowed through the western side of the burning pit and down to Woman Creek. It is possible that Pond 6 was constructed in the location of the burning pit (DOE 1992). It is unclear when Pond 6 and the water treatment plant backwash was abandoned, but, by 1964, Pond 6 was no longer present and the area was covered with fill (DOE 1996).

The effluent from the water treatment plant was discontinuous and probably made up of filter backwash, filter pre-wash, sludge blowdown, and other discharges from the water treatment process. It contained filterable solids removed from the raw water, as well as chemical flocculants (aluminum sulfate or lime) and residual chlorine (DOE 1992).

2.0 ACCELERATED ACTION

The IHSS Group SW-2 remedial action objectives (RAOs) (DOE 2005a) were developed to:

- Prevent direct contact with landfill soil and commingled waste, and
- Control erosion caused by stormwater run-on and runoff.

The remedial action plan for the IHSS Group SW-2 consisted of the following major activities to meet RAOs:

- Removal of surface soil "hot spots";
- Grading of landfill to slope of 18 percent;
- Construction of a soil buttress;
- Placement of a 2-foot-thick soil cover over the entire waste area;
- Construction of surface water diversion berms and perimeter channels;
- Site monitoring (groundwater and surface water); and
- Institutional controls.

The objectives of this action were principally met through the removal of the surface soil that was contaminated above the wildlife refuge worker (WRW) soil ALs.

To achieve the remaining objectives, an engineered soil cover was designed to prevent direct contact with landfill soil and commingled waste and control erosion caused by stormwater run-on and runoff (DOE 2005a).

Environmental Restoration (ER) accelerated action activities were conducted between February 2005 and August 2005. Starting and ending dates of significant activities are listed in the Final Detailed Schedule shown on Figure 4 of the CCCR (Attachment A). Photographs of site activities are presented in Appendix C of the CCCR (Attachment A).

2.1 Summary of Original Landfill Accelerated Action

Original Landfill accelerated action activities are briefly described in the following sections.

2.1.1 Hot Spot Removal

Soil from four locations with uranium activities greater than RFCA WRW soil AL were removed. These four locations are shown, along with uranium soil sampling results, on Figure 3. Surface soil was removed to a depth of approximately 0.2 feet at each location. Confirmation samples were collected to determine whether remaining soil had uranium activities less than WRW soil ALs. Results of confirmation sampling, along with the excavation areas is shown on Figure 4. Confirmation sample results indicate that residual soil concentrations are less than WRW soil ALs.

2.1.2 Engineered Soil Cover

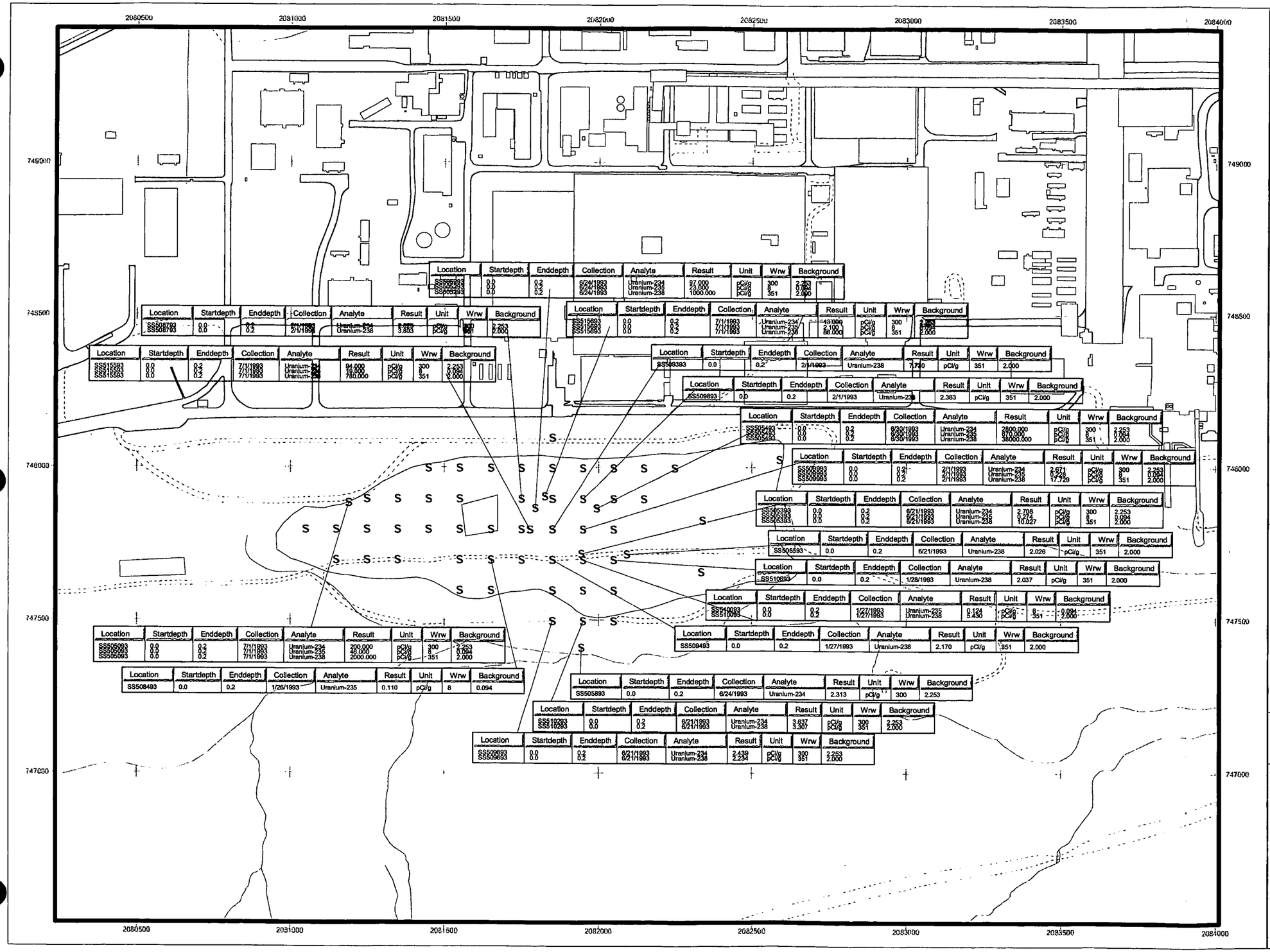
Section 4.0 of the CCCR presents the summary of the accelerated action, including a general description of the various construction items. The following text presents a general chronological order for the construction activities that took place at the OLF site (Attachment A):

- Mobilization and preparatory activities (Section 4.1);
- Stripping, clearing and grubbing at the OLF (Section 4.2);
- Waste removals and relocation (Section 4.3);
- Buttress construction (Section 4.4)
  - Excavation and subgrade preparation,
  - Drain rock layer,
  - Compacted buttress fill;
- Placement of grading fill (Section 4.5);
- Placement of cover soil (Section 4.6);
- Diversion ditch construction (Section 4.7)
  - Surface water diversion berms,
  - Perimeter channels;
- Revegetation at the OLF (Section 4.8);
- Erosion control matting (Section 4.9);
- New groundwater monitoring well installation (Section 4.10); and
- Summary of material quantities (Section 4.11).

2.1.3 Installation of Monitoring Wells

Monitoring wells in the OLF were abandoned as part of the Site Well Abandonment and Replacement Program in accordance with the Integrated Monitoring Plan. However, in accordance with the OLF IM/IRA, three groundwater wells were installed at the Original Landfill after accelerated actions were complete. These wells and their specifications are listed in Table 1 and their locations are shown on Figure 5. Wells will be monitored quarterly for VICs, SVOCs, metals including uranium, and pesticides.

Figure 3
Surface Soil Sampling Locations with Uranium Activities Greater Than Background Mean Plus Two Standard Deviations



KEY

- S — Concentration Greater Than Wildlife Refuge Worker Action Level
- S — Concentration Greater Than Background
- S — Concentration Less Than Background
- Dirt Road
- Stream
- IHSS
- Paved Road

Structure
- Demolished
- Standing

N W E S

100 0 100 200 300 Feet

Scale = 1:3,700

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: RADMS

Prepared for: KAISER•HILL COMPANY

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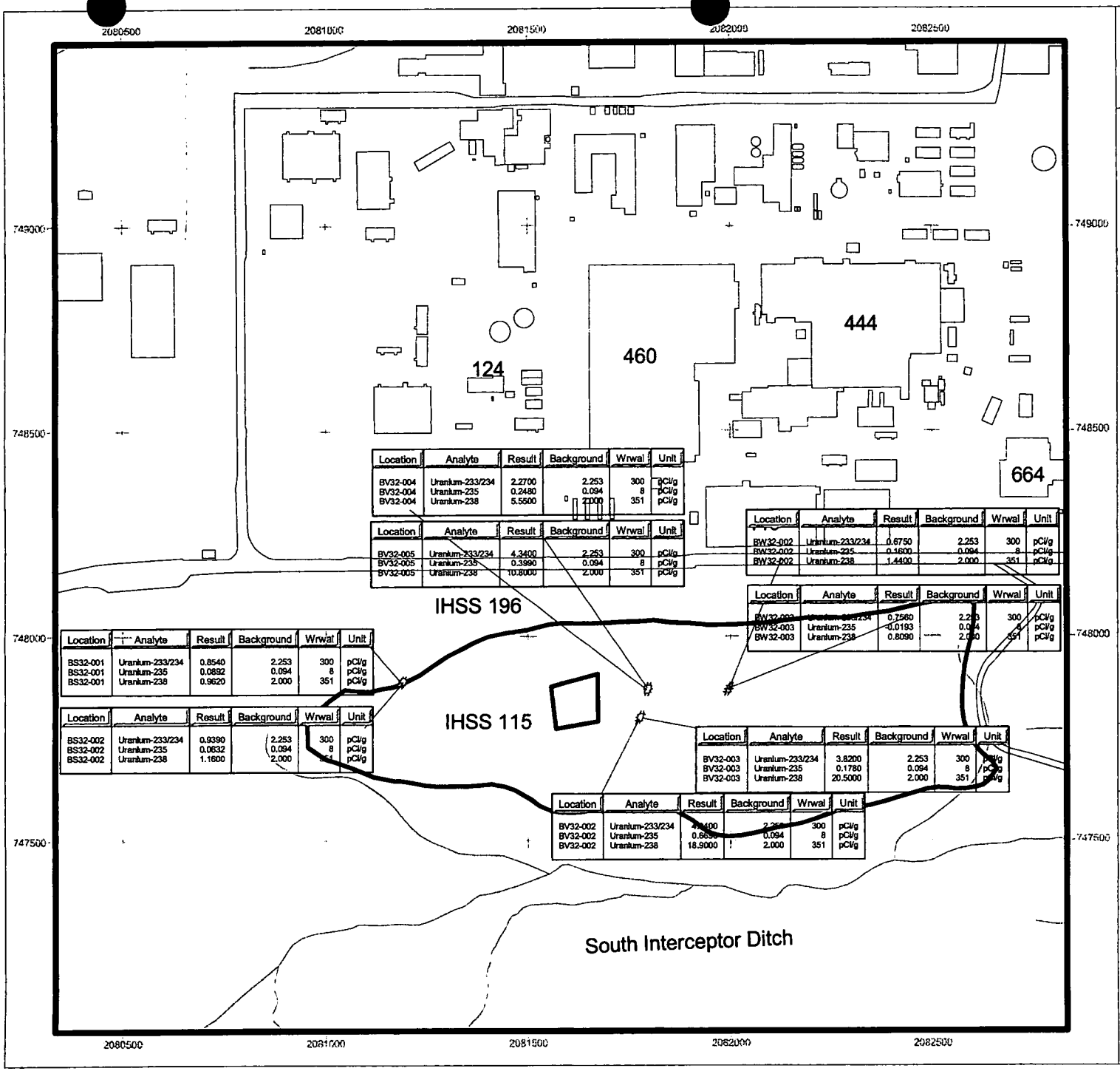

Location	Analyte	Result	Background	Wrwal	Unit
BV32-004	Uranium-233/234	2.2700	2.253	300	pCi/g
BV32-004	Uranium-235	0.2480	0.094	8	pCi/g
BV32-004	Uranium-238	5.5500	2.000	351	pCi/g

Location	Analyte	Result	Background	Wrwal	Unit
BV32-005	Uranium-233/234	4.3400	2.253	300	pCi/g
BV32-005	Uranium-235	0.3990	0.094	8	pCi/g
BV32-005	Uranium-238	10.8000	2.000	351	pCi/g

Location	Analyte	Result	Background	Wrwal	Unit
BW32-002	Uranium-233/234	0.6750	2.253	300	pCi/g
BW32-002	Uranium-235	0.1600	0.094	8	pCi/g
BW32-002	Uranium-238	1.4400	2.000	351	pCi/g

Location	Analyte	Result	Background	Wrwal	Unit
BW32-003	[illegible]	0.7560	2.253	300	pCi/g
BW32-003	Uranium-235	0.0193	0.094	8	pCi/g
BW32-003	Uranium-238	0.8090	2.000	351	pCi/g

Location	Analyte	Result	Background	Wrwal	Unit
BS32-001	Uranium-233/234	0.8540	2.253	300	pCi/g
BS32-001	Uranium-235	0.0892	0.094	8	pCi/g
BS32-001	Uranium-238	0.9620	2.000	351	pCi/g

Location	Analyte	Result	Background	Wrwal	Unit
BS32-002	Uranium-233/234	0.9390	2.253	300	pCi/g
BS32-002	Uranium-235	0.0632	0.094	8	pCi/g
BS32-002	Uranium-238	1.1600	2.000	351	pCi/g

Location	Analyte	Result	Background	Wrwal	Unit
BV32-003	Uranium-233/234	3.8200	2.253	300	pCi/g
BV32-003	Uranium-235	0.1780	0.094	8	pCi/g
BV32-003	Uranium-238	20.5000	2.000	351	pCi/g

Location	Analyte	Result	Background	Wrwal	Unit
BV32-002	Uranium-233/234	[illegible]	2.253	300	pCi/g
BV32-002	Uranium-235	0.6636	0.094	8	pCi/g
BV32-002	Uranium-238	18.9000	2.000	351	pCi/g

Figure 4
Confirmation Sampling Results

KEY

- # — Confirmation Sampling Location
- Stream or drainage
- IHSS 196
- IHSS 115
- Road

Building

- Demolished
- Standing

N W E S

100 0 100 200 Feet

Scale = 1:4,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: RADMS

Prepared for: KAISER-HILL COMPANY

File: W:\Projects\Fy2005\SW-2\olf_cor_figs.apr

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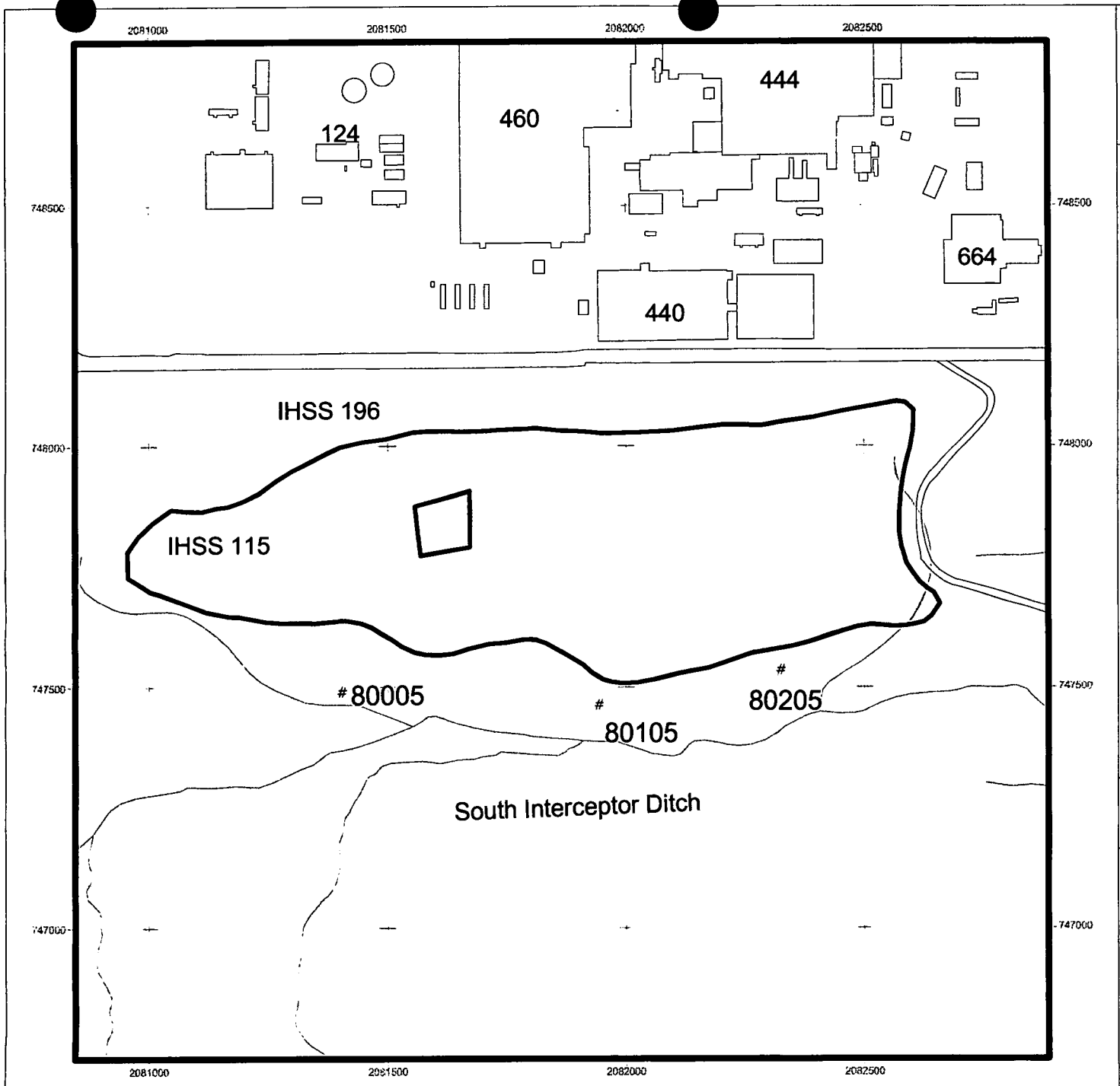

Figure 5
Groundwater Monitoring
Well Locations

KEY

Groundwater well

Stream or drainage

IHSS 196

IHSS 115

Road

Building

Demolished

Standing

N
W E
S

100 0 100 200 Feet

Scale = 1:3,500

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: RADMS

Prepared for: KAISER•HILL COMPANY

File: W:\Projects\Fy2005\SW-2\olf_cor_figs.apr

11/05

Table 1
Groundwater Well Specifications

Well Number	Longitude	Latitude	Surface Elevation	Top of Casing	Installation Date	Top of Screen	Bottom of Screen	Depth of Casing
80005	2081404.042	747489.979	5957.54	5960.19	8/9/05	5.8	20.8	21
80105	2081942.494	747463.414	5939.29	5941.97	8/8/05	4.95	19.95	20.15
80205	2082324.443	747535.636	5938.52	5941.67	8/10/05	4.75	19.75	20

3.0 RCRA UNIT CLOSURE

IHSS Group SW-2, the Original Landfill (IHSS 115) and the Water Treatment Plant Backwash (IHSS 196), is not a RCRA unit.

4.0 CHANGE MANAGEMENT

A formalized change management process described in the Design Analysis Document (DOE 2005b) was strictly adhered to in order to document all revisions and clarifications during construction. Appendix E of the CCCR provides copies of the design change records (Attachment A).

5.0 STEWARDSHIP ANALYSIS

The IHSS SW-2 stewardship evaluation was conducted through ongoing consultation with the regulatory agencies.

5.1 Current Site Conditions

As discussed in Section 2.1, accelerated actions at IHSS Group SW-2 consisted of the removal of surface soil "hot spots", removal of an abandoned natural gas pipeline, waste grading, monitoring well installation, placement of re-grade soil fill, buttress construction, placement of a 2-foot-thick soil cover, construction of surface water diversion berms and perimeter channels, and revegetation of disturbed areas.

5.2 Post-Accelerated Action Monitoring and Long-Term Surveillance and Maintenance

Post-accelerated action monitoring and long-term surveillance and maintenance considerations are addressed in Appendix B of the Final IM/IRA for the Original Landfill. The Final IM/IRA describes the following requirements for maintaining the final cover (DOE 2005a):

- Maintain the integrity and effectiveness of the final cover, including making repairs to the cover as necessary to correct the effects of settling, subsidence, erosion, or other events;
- Maintain and monitor the groundwater monitoring system and comply with all other appropriate requirements; and

- Prevent run-on and runoff from eroding or otherwise damaging the final cover.

Potential surface water impacts and water quality monitoring requirements are addressed in Table 1 of Appendix B of the Final IM/IRA for the Original Landfill. The table describes the requirements for monitoring the cover, berms and swales, surface water, groundwater, and the institutional and physical controls (DOE 2005a). The required performance monitoring wells were installed per the Final IM/IRA for the OLF as part of the OLF accelerated action project. Results from the performance monitoring wells will be reported in the RFETS Integrated Monitoring Plan (IMP) Report.

IHSS Group SW-2 will be evaluated as part of the Sitewide CRA. The CRA is part of the Remedial Investigation/Feasibility Study (RI/FS) that will be conducted for the Site. The need for and extent of any more general, long-term stewardship activities will also be analyzed in the RI/FS and proposed as part of the preferred alternative in the Proposed Plan for the Site. Institutional controls and other long-term stewardship requirements for the Site will ultimately be contained in the Corrective Action Decision/Record of Decision (CAD/ROD) and any post-RFCA agreement. This Closeout Report and associated documentation will be retained as part of the RFETS AR file.

6.0 DEVIATIONS

Summaries of the design changes, clarifications and revisions during construction as well as the field changes are found in Section 5.0 of the CCCR (Attachment A).

7.0 POST-ACCELERATED ACTION CONDITIONS

Construction was completed in accordance with the design set forth in the Accelerated Action Final Design for the Original Landfill, Construction QA/QC Plan (Appendix A of the CCCR) and the subsequent addenda created during construction (Attachment A). Appendix C of the CCCR contains project photographs.

8.0 SITE RECLAMATION

The OLF was seeded, straw crimped and hydro mulched. Erosion mat (degradable and permanent) was placed in surface water flow areas. Native seed mix was used on the cover. Sections 4.8 and 4.9 of the CCCR contain more detailed site reclamation information (Attachment A).

9.0 CONCLUSIONS

Results of the accelerated action justify NFAA for IHSS Group SW-2, the Original Landfill (IHSS 115) and the Water Treatment Plant Backwash (IHSS 196). Justification is based on the successful completion of the surface soil "hot spot" removal and the implementation of the approved closure design over the entire IHSS 115 area.

10.0 REFERENCES

CDPHE, 2005, Correspondence to J. Legare, DOE, RFFO; from S. Gunderson, CDPHE; RE: Original Landfill Design (May 2005), May 13.

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DOE, 2005b, Final Design Report and Design Calculation Documentation for the Accelerated Action for the Original Landfill at the Rocky Flats Environmental Technology Site, Rocky Flats Environmental Technology Site, Golden, Colorado, May.

Metcalf & Eddy, 1995, Draft Geotechnical Investigation Report for Operable Unit No. 5, ME-EEG-T-0009, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

ORIGINAL LANDFILL MONITORING WELLS ABANDONMENT

Well #	SPC Easting X	SPC Northing Y	Current Surface Elev. (ft.)	Final Surface Elevation (ft.)	Change fm. Current to Final Elevation (ft.)	Comment	Casing ID (in.)	Status	Impact to Project (bgs = below ground surface)
00197	2082562	747517	5927	-	-	Outside new countours	0.75	Abandoned	None
07086								Abandoned	Remove steel casing, 8' bgs, fill with bentonite to within 3' bgs
43392	2081536.76	748034.45	6041.86	6038	-3.86	Abandoned before	2	Abandoned	None
52693	2081505.1	747543.8	5951.82	5978	26.18		0.25	Abandoned	None
52793	2082003.2	747441.6	5937.71	-	-	Outside new countours	0.25	Abandoned	None
52893	2082002.1	747518.2	5938.32	5952	13.68		0.25	Abandoned	None
52993	2082001.7	747562.6	5939.87	5956	16.13		0.25	Abandoned	None
53093	2082005.4	747594.1	5950.53	5962	11.47		0.25	Abandoned	None
53193	2082003.4	747612.8	5953.38	5960	6.62		0.25	Abandoned	None
53293	2082003.9	747657.1	5966.64	5976	9.36		0.25	Abandoned	None
53393	2082736	747499.8	5917.48	-	-	Outside new countours	0.25	Abandoned	None
56994	2082008.7	747987.34	6019.8	6022	2.2		2	Abandoned	Remove 3' bgs
57094	2081996.02	747718.85	5970.2	5984	13.8		2	Abandoned	Remove 3' bgs
57194								Abandoned	Previously cemented; cut and cap 3' bgs; DO NOT remove cemented casing
57894	2081741.43	747564.97	5949.9	5972	22.1		0.5	Abandoned	None
57994	2082266.43	747547.26	5939.8	-	-	Outside new countours	0.5	Abandoned	None
58094	2082247.3	747451.63	5929.6	-	-	Outside new countours	0.5	Abandoned	None
58194	2082379.95	747493.45	5928.6	-	-	Outside new countours	0.5	Abandoned	None
58294	2082404.24	747565.51	5947.1	-	-	Outside new countours	0.5	Abandoned	None
58394	2082009.14	747881.21	5997.6	6004	6.4		2	Abandoned	Remove 3' bgs
58494	2082460.18	747921.98	5994.8	5998	3.2		0.5	Abandoned	None
58594	2082791.22	747518.54	5917.9	-	-	Outside new countours	0.5	Abandoned	None
58694	2082717.66	747669.93	5958.5	-	-	Outside new countours; abandoned before	0.5	Abandoned	None
58794	2082781.7	747702.89	5957.6	-	-	Outside new countours; abandoned before	0.5	Abandoned	None
59194	2081689.84	747996.6	6037.7	6034	-3.7		2	Abandoned	Remove 3' bgs
59294	2081619.77	747690.82	5980.8	5982	1.2		2	Abandoned	Remove 3' bgs
59393	2081489.1	747555.2	5952.62	5978	25.38		2	Abandoned	Remove 3' bgs
59493	2081535.5	747824.2	5990.76	6004	13.24		2	Abandoned	Remove 3' bgs
59593	2081786.2	747576.8	5951.75	5968	16.25		2	Abandoned	Remove 3' bgs
59594	2081243.75	747981.44	6046.7	6048	1.3		2	Abandoned	Remove 3' bgs
59694	2081356.09	747759.66	5997	6004	7		2	Abandoned	Remove 3' bgs
59793	2082128.1	747552.6	5944.85	5952	7.15		2	Abandoned	Remove 3' bgs
59794	2081634.53	747922.14	6006.4	6016	9.6		2	Abandoned	Remove 3' bgs
59893	2082527.9	747594.1	5946.26	-	-	Outside new countours	0.4	Abandoned	None
59993	2082132.1	747550.1	5944.2	5952	7.8		0.4	Abandoned	None
60093	2082046.3	747564.7	5945.21	5956	10.79		0.4	Abandoned	None
60193	2081950.4	747594	5949.05	5962	12.95		0.4	Abandoned	None
60293	2081846.8	747596.1	5949.38	5968	18.62		0.4	Abandoned	None
60393	2081539.3	747619.3	5963.07	5980	16.93		0.4	Abandoned	None
60493	2081257.4	747589.2	5984.57	5986	1.43		0.4	Abandoned	None
60593	2080973	747676.3	6015.11	-	-	Outside new countours	0.4	Abandoned	None
60693	2080896	747685.1	6023.61	-	-	Outside new countours	0.4	Abandoned	None
60793	2080821.9	747696.3	6030.3	-	-	Outside new countours	0.4	Abandoned	None
60893	2081584.6	747843.3	5999.89	6004	4.11		0.4	Abandoned	None
60993	2081948	747816.5	5985.37	5994	8.63		0.5	Abandoned	None
61093	2081952	747764.3	5972.02	5986	13.98		0.5	Abandoned	None
61293	2081148	747522.5	5985.03	-	-	Outside new countours	2	Abandoned	Remove 3' bgs
62693	2079925.6	747627	6041.6	-	-	Abandoned before	0.4	Abandoned	None
62793	2082304.1	747547	5939.43	-	-	Outside new countours	0.4	Abandoned	None
62893								Abandoned	None
63193	2082542	747696.8	5968.54	-	-	Outside new countours	0.5	Abandoned	Remove 3' bgs
63893	2081535.7	747828.1	5990.72	6004	13.28		0.5	Abandoned	None
63993	2081529.8	747821.6	5990.97	6002	11.03		0.5	Abandoned	None
64093	2081542.6	747817.9	5990.84	6004	13.16		0.5	Abandoned	None
71194								Abandoned	Previously cemented; cut and cap 3' bgs; DO NOT remove cemented casing
71494	2082003.3	747490.9	5937.69	5952	14.31		2	Abandoned	Remove 3' bgs

Abandoned	56
Not abandoned	0
Total	56

Status as of 3/9/05

Attachment A

Construction Completion and Certification Report Accelerated Action for the Original Landfill Rocky Flats Environmental Technology Site, Text and Appendices A - L

IHSS GROUP SW-2
ORIGINAL LANDFILL (IHSS-115 & 196)

ACCELERATED ACTION FOR THE ORIGINAL LANDFILL
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
CONSTRUCTION COMPLETION AND CERTIFICATION REPORT

ATTACHMENT A OF THE
FINAL CLOSEOUT REPORT

VOLUME I

Prepared for:

KAISER-HILL COMPANY, LLC
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
12101 Airport Way, Unit B
Broomfield, CO 80021

Prepared by:

TETRA TECH, INC.
1900 South Sunset Street, Suite 1-F
Longmont, Colorado 80501

Tetra Tech Job No. 19-4886.002.00

November 2005

TETRA TECH, INC.

Tetra Tech, Inc. is an Equal Opportunity Employer

Final
Construction Completion and Certification Report
Accelerated Action for the
Original Landfill
Rocky Flats Environmental
Technology Site

November 2005

ROCKY FLATS ORIGINAL LANDFILL ACCELERATED ACTION

CONSTRUCTION COMPLETION AND CERTIFICATION REPORT

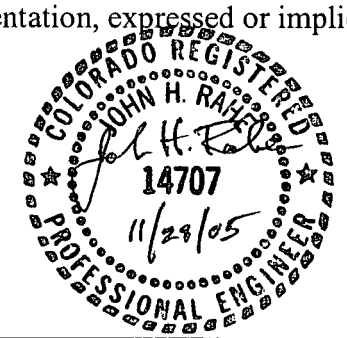
OWNER APPROVAL:

U.S. DEPARTMENT OF ENERGY DATE

CERTIFICATION

Construction Quality Assurance Engineer (CQAE)

The undersigned Construction Quality Assurance Engineer hereby certifies that the buttress and the Original Landfill (OLF) Accelerated Action at the Rocky Flats Environmental Technology Site were constructed in substantive compliance with the Final CDPHE-approved Design Plans and Specifications and approved design and field changes during construction, except as noted in this document. Further, the undersigned certifies that the construction quality assurance was performed in accordance with the requirements of the OLF Final Design Construction Quality Assurance/Quality Control (QA/QC) Plan and subsequent approved changes during construction. This certification is based on construction QA observations and tests and information supplied by the QC inspection, testing and surveying. This certification does not include any component of the design of the OLF Accelerated Action, does not certify compliance with Resource Conservation and Recovery Act (RCRA) or any other landfill closure design or closure standard and does not include short or long-term performance of the OLF closure. No other representation, expressed or implied, and no warranty or guarantee is included or intended.



John H. Rahe, P.E.
Construction Quality Assurance Engineer
Colorado Professional Engineer No. 14707
Tetra Tech, Inc.

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ACRONYMS AND ABREVIATIONS

AR	Administrative Record
ARAR	applicable or relevant and appropriate requirement
ASTM	American Society of Testing and Materials
ATT	Advanced Terra Testing, Inc.
BMP	best management practice
BZ	Buffer Zone
CAD/ROD	Corrective Action Decision/Record of Decision
CAT	Caterpillar
CCCR	Construction Completion and Certification Report
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CHWA	Colorado Hazardous Waste Act
cm/sec	centimeters per second
COE	U.S. Army Corps of Engineers
CQA	Construction Quality Assurance
CQAE	Construction Quality Assurance Engineer
CQC	Construction Quality Control
CWA	Clean Water Act
cy	cubic yard
DOE	U.S. Department of Energy
Dwg	Drawing
ECR	Engineering Change Request
EPA	U. S. Environmental Protection Agency
ESD	East Subsurface Drain
EZ	Exclusion Zone
ft/ft	feet per foot
gpm	gallons per minute
HASP	Health and Safety Plan
IA	Industrial Area
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action
K-H	Kaiser-Hill Company, L.L.C.
lbs/in	pounds per inch
lf	linear feet
LGP	Low Ground Pressure
MDD	maximum dry density
mph	miles per hour
MQC	manufacturer's quality control
NAG	North American Green
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System

ACRONYMS AND ABREVIATIONS – CONT.

OLF	original landfill
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
oz/sy	ounces per square yard
PE	Professional Engineer
PPE	personal protective equipment
psi	pounds per square inch
QA	quality assurance
QC	quality control
QCSM	Quality Control Site Manager
RAO	remedial action objective
RI/FS	Remedial Investigation/Feasibility Study
RFA	Rocky Flats Alluvium
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RFI	Request for Information/Clarification
RM	Responsible Manager
sf	square feet
SID	South Interceptor Ditch
sy	square yard
SQAM	Site Quality Assurance Manager
SWMU	solid waste management unit
T	ton
TRM	turf reinforcement mat
Tt	Tetra Tech, Inc.
WARP	Well Abandonment and Replacement Program
XCEL	Xcel Energy Company

1.0 INTRODUCTION

This section presents the project location and background information for the Original Landfill (OLF) Accelerated Action Closure at the Rocky Flats Environmental Technology Site (RFETS). The purpose and scope of this Construction Completion and Certification Report (CCCR) is discussed and an overview of the OLF Accelerated Action is presented.

1.1 Project Location and Background

RFETS is a government-owned, contractor-operated facility formerly used for the fabrication of miscellaneous weapons components for national defense. The 6,550-acre site is located in Jefferson County, Colorado, approximately 16 miles northwest of Denver. The site occupies approximately 10 square miles (Figure 1).

Centrally located within the RFETS boundary is a 400-acre area referred to as the Industrial Area (IA). The IA contained approximately 400 buildings along with other structures, roads, and utilities, and is where the majority of RFETS mission activities took place between 1951 and 1989. The remaining 6,150 acres consist of undeveloped land used as a Buffer Zone (BZ) to further limit access to the previous operations area.

Between 1952 and 1968, approximately 74,000 cubic yards of solid waste consisting of construction and other debris and general plant waste contaminated with or commingled with small amounts of wastes with hazardous constituents were disposed in the approximately 20-acre OLF, IHSS-115. The OLF is located on the southern-facing slope just south of the IA pediment and borders the northern side of Woman Creek. Because of the slope angle and underlying bedrock characteristics, this area has been identified as susceptible to landslides and erosion.

From the early 1950s until 1971, filter backwash wastewater generated by the raw water treatment process in Building 124 to make potable water was discharged to settling and evaporation ponds located roughly in the center of IHSS 115, designated the Filter Backwash Pond, IHSS 196. A soil cover was placed over the disposed waste when the OLF was closed in 1968. Some of the wastes and debris have become exposed through erosion of the soil cover over the wastes that were placed at steep slopes. Besides the soil cover, soil fill material was used in the waste disposal operation. The total volume of disposed waste and commingled soil is estimated at 160,000 cubic yards.

IHSSs 115 and 196 were formerly part of OU 5, the Woman Creek Priority Drainage, which was consolidated into the IA OU when Rocky Flats Cleanup Agreement (RFCA) became effective in July 1996. Prior to this consolidation, a Phase 1 Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) for OU-5 was conducted pursuant to an RFI/RI Work Plan, which was approved by CDPHE and EPA in 1992 (EPA 1992a, 1992b; CDPHE 1992). For purposes of the investigation work the OU-5 IHSSs (and

Potential Areas of Concern [PACs]) were separated into specific Areas of Concern (AOCs). The IHSSs 115 and 196 were designated AOC 1.

The OLF was not designed or operated as an engineered landfill. Waste was dumped in the area vertically below and just south of the southern edge of the alluvial pediment on which the RFETS IA is located. The waste disposal area lies north of Woman Creek. The waste was generally spread over the south-facing hillside, serving to fill in the area below the pediment edge. No liner or other collection barrier was installed between the waste and the existing surfaces.

The reach of Woman Creek adjacent to the western portion of the OLF was relocated because the creek threatened to erode into landfill materials (Singer 2002). Specific information on the relocation of Woman Creek, including when the creek was relocated, is not available.

The South Interceptor Ditch (SID) was constructed in 1980 within the southern portion of the OLF to intercept surface water and divert such water east to the C-2 pond. Two outfall pipes crossed the OLF site. The original outfall pipe, constructed in 1986 (EG&G 1994), discharged storm water directly onto the landfill. This caused sloughing and sliding of the fill material. Slide material may have been removed from the SID and placed on the southern side of the gravel road constructed south of the SID (Metcalf & Eddy 1995). Sometime between 1986 and 1988, the original outfall pipe was abandoned and a new outfall pipe was constructed southeast across the OLF to discharge to the SID east of the landfill boundary. The buried outfall pipe discharged into a collection basin located east of the OLF. Sloughing, erosion, and construction of the outfall pipes may have exposed landfill waste at the surface

Three separate response actions have been undertaken at the OLF. In July 1979, contractors grading a road southwest of former Building 444 (removed) outside the perimeter fence uncovered a portion of the landfill, three locations of depleted uranium were identified and one box of contaminated soil was removed (OLF IM/IRA, 2005).

In 1990 an inspection identified exposed radioactive debris in the northwestern part of the OLF (EPA 1990) and a gamma radiation survey conducted in late 1990 identified ten locations of elevated gamma radiation (Kaiser-Hill 1996). Further investigations in 1993 identified various areas of anomalous radiation levels and subsequent removals of materials were performed including depleted uranium.

In July 2004, surface soil contaminated with uranium above Wildlife Refuge Worker Action Levels was removed from the OLF (see IM/IRA, March 2005).

1.2 Purpose and Scope of Report

The accelerated action closure addresses the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remediation and the closure of the Original Landfill at the RFETS. This CCCR provides documentation of the accelerated action closure of the OLF.

Certification is provided that the closure activities have been performed in accordance with the final EPA and CDPHE-approved Accelerated Action Design for the OLF, approved design and field changes during construction and the final Construction QA/QC Plan (Kaiser-Hill, 2005). This CCCR is intended to meet the requirements of the Certification Report and the Construction Completion Report as required by Sections 8.2 and 8.3, respectively, of the QA/QC Plan (Appendix B). This certification is based on construction QA observations and tests and information supplied by the QC inspection, testing and surveying. The certification does not include compliance with full-time QC inspection requirements and does not include any component of the design of the OLF Accelerated Action, does not certify compliance with RCRA or any other landfill closure design or closure standards and does not include short or long-term performance of the OLF Accelerated Action.

Included in this CCCR are descriptions of the general construction sequence, construction equipment and personnel, summary of the OLF Accelerated Action, design and field changes during construction, a summary of quality assurance and quality control during construction including a summary of non-conformances and resolutions, a summary of environmental monitoring during construction, construction reporting records, a summary of the pre-final and final inspections, the as-built drawings and final certified topographic as-built survey. Appendices to the CCCR include the construction drawings and specifications, the QA/QC Plan, a project photographic log, the applicable contractor's construction submittals, requests for information and engineering change requests, the QA/QC documentation, final certified record survey drawings, supplemental slope stability computations, and the CDPHE and EPA comments on the Draft OLF CCCR with K-H/DOE responses.

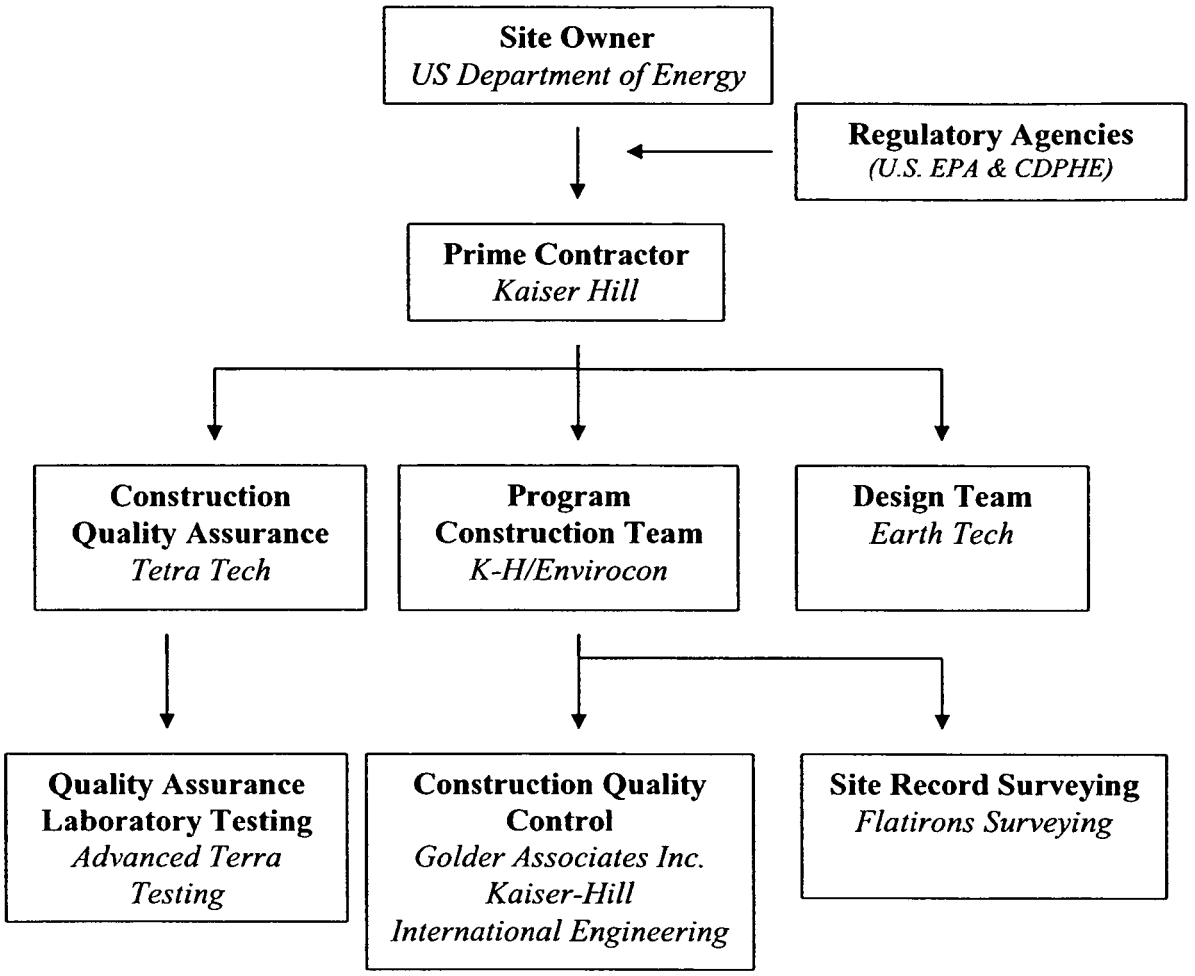
Post-closure care requirements are not included in this document but are addressed in a separate monitoring and maintenance plan.

1.3 Overview of Original Landfill Accelerated Action

The OLF accelerated action consisted of regrading a portion of the OLF, backfilling the SID, placement of compacted grading soil, construction of an engineered buttress fill at the toe of the OLF, placement of a 2-foot thick Rocky Flats alluvium soil cover, installation of runoff control berms, channels and outfalls, removal of an abandoned natural gas pipeline, revegetation and installation of down gradient groundwater monitoring wells.

1.4 Project Organization

This section consists of the project organization for the accelerated action closure of the OLF. Lines of communication and responsibility are discussed in this section as well.



1.4.1 Site Owner and Prime Contractor

The owner/operator of the RFETS is the Department of Energy (DOE) which is responsible for all accelerated actions and closure activities at the site. The prime contractor for the DOE at the RFETS is the Kaiser-Hill Company, LLC (K-H). K-H has overall responsibility for implementation of the design and construction of the OLF Accelerated Action.

1.4.2 Regulatory Oversight Agencies

The regulatory agencies having oversight responsibility at the OLF closure are the Colorado Department of Public Health and Environment (CDPHE) and the U.S. Environmental Protection Agency (EPA). U.S. Fish and Wildlife participated in the planning and implementation of the design.

1.4.3 Program Construction Team

The Program Management Contractor (PMC) for the OLF closure construction was the Kaiser-Hill Company (K-H). The earthwork sub-contractor was Envirocon, Inc., including earthwork and revegetation. Flatirons Surveying, Inc. performed the site record surveying for the OLF closure project.

1.4.4 Design Team

The design team for the OLF Accelerated Action consisted of K-H along with Earth Tech, Inc. (Earth Tech) as the design sub-contractor. Earth Tech developed and stamped the design drawings, specifications, Construction QA/QC Plan and the design analysis and calculations report with review by K-H and approval by DOE and the regulatory agencies. Earth Tech representatives approved all applicable Engineering Change Requests (ECRs).

1.4.5 Construction Quality Control Team

The construction quality control team consisted of personnel from Golder Associates Inc. (Golder) for the majority of the project. Golder performed all CQC field and laboratory testing for earthwork for the OLF closure. Additional QC was performed by personnel from International Engineering and from K-H.

1.4.6 Construction Quality Assurance Team

The construction quality assurance team consisted of Tetra Tech (Tt) as the construction quality assurance (CQA) sub-contractor to K-H. Advanced Terra Testing, Inc. (ATT) performed the QA laboratory testing and the field QA testing was performed by both Tt and ATT.

1.4.7 Construction Quality Assurance/Quality Control Plan

The construction QA/QC procedures and requirements were defined in the Final Design Submittal Construction Quality Assurance/Quality Control Plan, included as Appendix B of this CCCR. This document requires both a Construction Certification Report (CCR) and a construction completion report, which are combined in this CCCR. The QA/QC document defines the various roles and responsibilities of the construction QA/QC personnel, specifies requirements of the various QC and QA conformance tests and procedures and defines the various QA/QC meetings, communications and documentation required for the project.

2.0 GENERAL CONSTRUCTION SEQUENCE OF ORIGINAL LANDFILL ACCELERATED ACTION

This section presents the general construction sequence of the Original Landfill Accelerated Action from initiation of work in the spring of 2005 through the completion and closeout of the project in the late summer of 2005. A complete detailed schedule is presented on Figure 4. Section 4 of this CCCR presents a more detailed description of the work performed for the OLF closure.

Major closure work at the OLF began following approval of the final design drawings, specifications and QA/QC Plan on May 13, 2005.

2.1 Mobilization and Site Preparatory Work

Mobilization and site preparatory work for the OLF closure began in March to April 2005 as discussed below in Section 4.1. The mobilization and preparatory phase concluded in mid-May when closure construction at the OLF began.

2.2 Buttress Construction

The design documents were approved by CDPHE and construction of the engineered buttress began on May 13, 2005 with foundation preparation and continued until July 14 when the compacted buttress fill was substantially completed.

2.3 Fill and Regrading

Regrading of the OLF and placement of compacted regrade fill within the OLF closure began on May 16 and was essentially completed by July 20, 2005. Regrading the cover soils continued into August 2005.

Placement of cover soils was essentially complete by July 30, 2005.

2.4 Surface Water Management

The west drainage channel construction began in late June and both east and west drainage channels were completed by July 30, 2005. Construction of the diversion berms on the final cover surface of the OLF were initiated on July 18, 2005 and substantially completed by August 12, 2005.

2.5 Completion and Closeout

Substantial completion of the OLF closure was achieved on September 12, 2005 and the earthwork subcontractor demobilized by September 12, 2005. The groundwater monitoring wells were installed the week of August 8, 2005, landfill cover revegetation and erosion controls were completed in early September and the final seep mitigation at the closure was completed on September 12, 2005.

3.0 CONSTRUCTION EQUIPMENT AND PERSONNEL

This section presents the construction equipment and personnel utilized at the OLF to perform the closure activities by the construction team. Construction of the OLF closure was performed typically using two 10-hours per day shifts five days per week through July. The final work in late July, August and early September was performed using only the day shift with some work performed until dark in the evening.

3.1 Construction Equipment

The construction contractor's equipment varied from 10 to 12 pieces of equipment during the early phases of the project to 15 to 20 pieces of equipment during the middle to latter phases of construction. These included haul dump trucks, motor graders, wheel tractor-scrapers, bulldozers, large pad-foot (sheepsfoot) compactors, smooth drum/vibratory roller, rubber-tired and tracked backhoe excavators, front-end loaders, forklifts, water truck, fuel truck, and tractor with disk. In addition to these, various 20 cy end-dump and belly-dump and flat-bed haul trucks were used by offsite material haulers to deliver earthwork and geosynthetics materials to the site. The type and number of each piece of equipment utilized on the site by the construction contractor is listed below:

The following equipment was utilized on the site during construction, some of which were utilized for various periods:

Motor Grader Caterpillar (CAT) 140H (2)
Front End Loader Komatsu (1)
Front End Loader Cat 966G (1)
Excavator CAT 345 (1)
Excavator Track Hoe Deere 450LC (1)
Excavator Track hoe Hitachi EX225
Scrapers CAT 633D (2)
Scrapers CAT 627 (2)
Bulldozer CAT D10R (1)
Bulldozer CAT D9R (1)
Bulldozers CAT D6R Low Ground Pressure (LGP) (1)
Bulldozer CAT D5R (1)
Smooth Drum Compactor with Vibratory Ingersoll 100 Rand (1)
Sheepsfoot (Pad-Foot) Compactor CAT 825G (2)
Sheepsfoot (Pad-Foot) Compactor CAT 815G (2)
Water Trucks (2)
Fuel Truck (1)
Forklift Hyster 550 (1)
Dump Trucks Volvo A40 (2)
Dump Trucks Volvo A35 (2)
Tractor, John Deere, with Disk (1)

Straw Crimper
Hydro-Mulch Truck (2)
Hay Buster
Ditch Witch Trencher

3.2 Construction Personnel

The construction personnel included construction program management personnel from K-H, earthwork construction personnel from Envirocon, construction quality control personnel from Golder, International Engineering and K-H/CH2M Hill and survey personnel from Flatirons Surveying.

3.2.1 Earthwork Personnel

Earthwork crews varied in size of up to 25 personnel depending upon the extent of earthwork being performed. In general the day crews were larger than the night crews. These included supervisors, equipment operators, spotters/flaggers, mechanics/oilers, and laborers.

3.2.2 Construction Quality Control Personnel

Construction quality control personnel typically included one field earthwork sampling and testing personnel per shift and various testing personnel in Golder's testing laboratory. The Quality Control Site Manager (QCSM) function was performed by several individuals throughout the course of the project including: Ron DiDonato, Michael Place and Jim Koffer, all of Golder Associates, Inc. Mr. Jim Elliot of International Engineering also performed QCSM functions for several days during the project. One to three personnel from Flatirons Surveying were typically on site during construction each shift.

4.0 SUMMARY OF ORIGINAL LANDFILL ACCELERATED ACTION

This section presents the summary of the Original Landfill Accelerated Action including a general description of the various construction items. These summary descriptions are presented in a general chronological order from mobilization and preliminary activities through seeding of the OLF. A summary of installed quantities is also provided in this section. Figure 3 presents a general plan of the OLF with major features of the accelerated action. The As-Built Drawings and Final Topographic Survey (map pocket) of the OLF indicate details of the final accelerated action at the OLF.

All construction activities discussed below were in compliance with the Final Design Drawings, Specifications, QA/QC Plan and approved design and field changes during construction.

4.1 Mobilization and Preparatory Activities

Mobilization and preparatory activities began with the construction of a west access road across the railroad tracks south from Cactus Boulevard for truck and heavy equipment access to the lower portion of the OLF (Figure 2). Other mobilization and preparatory work performed included removal of vegetation and clearing/grubbing of trees from the footprint of the OLF closure. Monitoring wells scheduled for abandonment were removed, as stated in the Closeout Report for the project (see Table at the end of Closeout Report). The construction contractor moved in an office trailer and necessary equipment prior to construction activities.

4.2 Stripping, Clearing and Grubbing at the OLF

Stripping, clearing and grubbing, operations at the OLF were performed using excavators to remove the existing vegetation. This material was stockpiled northwest of the OLF for later use as topsoil amendment on the OLF final cover. Various large trees were removed and grubbed from the central portion of the OLF. Small trees and shrubs (less than approximately 6-inches in diameter) were chipped and incorporated into the landfill. Such material was spread within the landfill and not placed in one area. Surface material excavated from the buttress fill area consisted of valley alluvium containing high organics which were stockpiled east of the OLF and later mixed as an amendment to the base of the 2-foot RF alluvium cover materials.

4.3 Waste Regrading

Various areas of miscellaneous wastes (molds, concrete, rubble, metal etc.) were encountered during the regrading operations. Waste was regraded to the subgrade 1 or lower elevations, except in one area (see Section 5.4, RFI No. 11). Such waste was typically placed within the fill areas and the SID area at the OLF. The waste was then covered with compacted RF alluvium and/or compacted Pioneer pit fines to subgrade 2 elevations (base of 2 ft soil cover). An area of

approximately one acre within the central portion of the OLF did not have compacted regrade soil above waste materials but only the 2-foot RF alluvium soil cover. This was done for health and safety concerns during construction as discussed below in Section 5.3. Flatirons Surveying record drawings show the location of this area (Appendix H).

4.4 Buttress Construction

This section presents the description of the buttress construction along the toe of the OLF including the subgrade preparation, construction of the drain rock layer and compacted buttress fill. As-Built Drawings (51788-003 and 004) and Final Record Survey Drawings (Sheets 4, 5 and 6 of 7, Appendix H) indicate constructed as-built conditions for the buttress.

4.4.1 Temporary Dewatering

Temporary dewatering was performed during construction of the buttress fill. This required three sump pump locations at the south side of the buttress excavation and fill with discharge of water downstream in the SID. Pumping of groundwater continued throughout construction and temporary dewatering systems were removed following construction (see As-Built Drawing 003).

4.4.2 Excavation and Subgrade Preparation

Excavation of the buttress area included clearing and grubbing of the existing vegetation and removal of unconsolidated fine-grained soft valley alluvium soils. Such soils containing high organics were stockpiled on the northeast side of the OLF for later use in the cover soil construction. Additional soft and/or wet materials were removed from the base of the buttress area and the area was inspected by a geotechnical engineer to verify that soft materials had been sufficiently removed. Various wet areas were then backfilled with approximately one foot of 1.5-inch crushed rock and dry areas were backfilled with compacted RF alluvium. The back (north) wall of the buttress was also cleared and grubbed prior to buttress construction

Percolation test pits were performed within the valley alluvium materials below the buttress fill to demonstrate that drainage from the drain rock layer could adequately discharge through the native alluvium. Such tests verified that the design drainage conditions could be met (see Appendix F.2).

A biaxial geogrid was placed over the entire excavated surface of the buttress area. The geogrid was overlapped a minimum of 2 feet with ties placed every few feet in accordance with the manufacturers recommendations. This geogrid material consists of a polyester core with a polymeric coating having the same performance characteristics as the high density polyethylene geogrid originally specified. Large rocks in the subgrade were removed from under the geogrid

to achieve the subgrade required. Various portions of the geogrid that became damaged during subsequent drain rock placement required patching with overlapped and tied sections as necessary. All geogrid was adequately placed and patched as necessary to meet specifications. The extent of the geogrid placed beneath the buttress is indicated on Record Survey Sheet 6 of 7 (Appendix H).

4.4.3 Drain Rock Layer

The drain rock layer was then placed on top of the geogrid with delivery in articulated dump trucks, placing with a front end loader and spreading/rough grading with a bulldozer from west to east in a nominal 12-inch thick layer. The drain rock was then compacted using a smooth drum roller in the vibratory mode. Drain rock was extended up the back slope as necessary and compacted with the compactor operating in the non-vibratory mode. The drain rock was placed to an average thickness of approximately 1.4 feet with a minimum placed thickness of 0.8 foot, which was in compliance with ECR Number 5 discussed below in Section 5.2. The boundaries of the installed drain rock are shown on Record Survey Sheet 5 of 7 (Appendix H).

4.4.4 Compacted Buttress Fill

Compacted buttress fill consists of pit fines from the Centennial, LaFarge and Pioneer pits. All materials, although slightly differing in grain size and portions out of original specifications, were shown to meet specifications for compacted strength as discussed in Section 5.1. Therefore, all materials were sufficient for the compacted buttress fill. All compacted buttress fill materials are a clayey sand material (SC).

The nominal 8 ounce per square yard (oz/sy) non-woven geotextile was installed over the top of the drain rock prior to placement of the buttress pit fines. The geotextile was intended to act as a separator between the drain rock and the buttress fill. This geotextile was placed in sections from the west to east end, and overlapped a minimum of 24 inches. The geotextile was placed on the back slope area and anchored in a small (6-inch) V-trench at the top of the slope and covered with a protective layer of soil typically one-foot thick. Various sections of geotextile that were damaged from buttress fill equipment were adequately patched with new patch sections overlapping damaged areas by at least 2 feet.

Typically the pit fines were delivered to the buttress area in 20 cy haul trucks and spread in approximately 12-inch lifts using CAT D8 and D9 bulldozers and the CAT 815 an 825 machines. The material was then compacted with the large sheepsfoot compactors (C825 and C815; also known as "pad foot" compactors). The materials were typically disked to achieve the required moisture content within 2 percent of the optimum moisture content. The materials were then compacted with the sheepsfoot compactors to achieve the required minimum density of 95 percent of the maximum dry density (MDD) as determined by the Standard Proctor Density Test (ASTM D 698). Following all placement, compaction and in some cases reworking of the

materials, the pit fine materials were all within required moisture and compaction specifications, except as noted in Section 6.3.

An excavator and D5 bulldozer were used to cut and shape the south embankment slope (toe) of the buttress to the required 3(horizontal):1(vertical) slope. A bulldozer was then used to place the 2-foot RF alluvium soil cover as discussed below in Section 4.6

4.5 Placement of Regrade Material

Placement of imported regrade material began during the waste regrade and consisted of placing and grading on the east and west sides of the OLF. Material removed from regrading was placed within the fill areas of the OLF including the SID. Materials used for grading fill consisted of approximately one-half RF alluvium and one-half pit fines from the Pioneer pit. These materials were imported from offsite and blended during the placement, grading and compaction effort.

Compaction of materials from the Pioneer Sand Company pit was demonstrated through the use of a test section and use of the large sheepsfoot (also technically known as "pad foot") compactors (C815 and C825). It was demonstrated that placement of the pit fines in approximately 12-inch lifts with compaction using at least 2 passes of either the CAT 815 or CAT 825 sheepsfoot compactors was sufficient to meet specifications (95% of MDD, ASTM D 698). The Pioneer pit fines used for grading fill at the OLF were delivered in side dump trucks, spread using CAT D8, D9 and D10 bulldozers and compacted with at least 4 passes of the CAT 815 and 825 sheepsfoot compactors to ensure adequate compaction was achieved. A road base material was also approved by the designers, but was never used in the regrade.

Placement of compacted grading fill was also performed in the SID area following removal of soft soils from this area. A portion of an abandoned natural gas line was removed from areas of the previous access road along the edge of the SID. The ends of the remaining portion of the gas line were surveyed, photographed and then plugged with grout in accordance with approved site procedures (see Final As-Built Topographic Survey, map pocket).

Placement and compaction of RF alluvium for regrade material included placement in approximately 12-inch lifts with compaction using at least 4 passes of the CAT 815 and 825 sheepsfoot compactors. Typically the CAT 815 and 825 machines were used together to achieve the required minimum of 4 passes. Partially based upon a test pad performed for the PLF (using a CAT 825 where test pits were excavated into compacted RF alluvium and a loaded scraper was subsequently used to verify less than 1-inch deflection) the placement and compaction procedures established at the OLF for the same RF alluvium material were judged by CQA to be adequate to achieve the required shear strength of the material. Typically, RF alluvium when even moderately compacted will achieve both high internal friction angles and cohesion because of the nature of the material containing both rock fragments up to 12 inches and silt to clay size fractions. Based upon field visual assessments of compacted RF alluvium fill materials, the use of both the CAT 815 and CAT 825 compactors was determined to be acceptable when at least 4 passes was achieved.

The grading fill was placed at the design grade of 18 percent or approximately 5.5:1. The typical minimum depth of grading fill over landfill waste was one foot with a small area near the top of the central swale having approximately 0.7 feet of grading fill and three central areas totaling approximately 1.5 acres without grading fill (Final Topographic As-Built Survey).

4.6 Placement of Cover Soil

The cover soil consists of a 2-foot thick layer of RF alluvium placed over the subgrade surface (subgrade 2) and over the buttress fill materials. The material was placed from west to east following regrading and placement of the grading fill to design grades. Portions of the regraded surface which had become too dry were moisture conditioned (wet down) and recompacted with the CAT 815 or 825 sheepsfoot compactors to provide adequate bond between the grading fill and the cover soil. The majority of the grading fill on the 18 percent slope had an average 3-inch thick layer of organic valley alluvium (obtained from the buttress foundation excavation) placed prior to placement of the cover soils.

A large portion of the RF alluvium cover soils were placed with wheel tractor-scrapers. A smaller portion of the RF alluvium cover soils were delivered and stockpiled on the edge of the OLF. The stockpiled material was spread on the regrade surface using large bulldozers. Following placement of the soils in a 24-inch lift, the materials were then ripped and/or disked to a depth of approximately 6 to12 inches prior to placement of erosion control material.

Topsoil previously removed and stockpiled on the site was placed in an average 3-inch thick layer over areas on which permanent turf reinforcement mats were placed such as in the drainage channels and on the lower 10 vertical feet of the buttress side slope. This material, which was recommended and approved by EPA and CDPHE, was placed below the erosion mats to enhance vegetation growth.

The cover soils over the buttress fill 3:1 slope were placed following completion of the compacted buttress fill soils. These were placed with a bulldozer "track walked" up and down the slope.

Portions of the cover soil thickness were less than the specified 2-feet (1.96 ft. min.). These accounted for less than 7 percent of the thickness tests surveyed for the final cover, and the average thickness of cover soil was in excess of the 2-foot thickness specified as measured vertically between survey points. The Record Survey Drawing (Sheet 2 of 7, Appendix H) rounds the thicknesses to the nearest 0.1 foot. This is acceptable according to Specification Section 01310, Part 3.02A.1 (Appendix A).

4.7 Surface Water Management System

The surface water management system at the OLF consists of a series of diversion berms/ditches on the final cover soil for the OLF which discharge surface flow into drainage channels along the east and west sides (Figure 3). Construction of the upper West Channel began first followed by

the diversion berms and the East Channel (see As-Built Drawings 008 and 009 and the Final As-Built Topographic Survey).

4.7.1 Diversion Berms

Diversion berms were constructed along the final grade of the OLF at seven locations as designed. The flow-line grade was surveyed at an average of approximately 2 to 5 percent. These were constructed with RF alluvium to the design dimensions and grades. Three of the diversion berms begin at the central swale area and divert runoff to the west drainage channel while four of the berms divert runoff to the east drainage channel. These were constructed to approximate line and grade with an LGP D6 bulldozer and a D5 bulldozer.

The downhill side slope of the diversion berms was flattened to approximately 2.5 to 3:1 from the design slope of 2:1 for constructability. This should improve long-term stability and erosion resistance of the berms as well. The synthetic "georidges" were placed in the diversion ditches as designed. These are temporary units designed to be removed after vegetation becomes established.

A small portion of the lower west diversion berm was constructed over a wet area resulting from a small seep. To stabilize the berm in this area a small subsurface drain with 6" rock and geotextile were installed to divert the seep into the buttress sub-drain and thereby prevent saturation of the berm.

Various portions of the final surface diversion ditches along the diversion berms had gradients less than the specified 2 percent grade (1.9 percent along portions of Diversion Berms 1, 4 and 5) and a short portion had a gradient greater than 5 percent (5.3 percent maximum at west end of Diversion Berm 2). Portions of the diversion berm heights from the ditch inverts to the top of the adjacent berms were less than the specified 2 feet, while the average height was 2 feet. The overall grade of the diversion ditches/berms was within the specified 2 to 5 percent grade.

The minimum height of the diversion berms on the up-gradient side adjacent to the diversion ditches was specified at 2 feet. Although minor areas had heights slightly less than 2 feet, the average height between the ditch invert and adjacent top of berm ranges from 2.0 to 2.2 feet.

4.7.2 Drainage Channels

The drainage channel on the west side of the OLF began from the northwest area and proceeded down the west slope. A portion of the channel was constructed first down to the access road to the buttress area. When the buttress was completed and the access road was no longer needed, the west drainage channel was completed. To match existing grades at the outfall, the end grade was raised from the design approximately one foot. The end of the West Channel at the final rock boulder area contains a small depressed area of lower grade than the downstream area, which is acceptable and will likely provide for better energy dissipation of high flows (See Section 6.3 and As-Built Dwg. 009).

The drainage channel on the east side of the OLF was constructed following construction of the east subsurface drain as discussed below in Section 5.3. This East Channel was constructed to the design line and grade. The lower east portion of the channel embankment was increased in height with compacted fill to achieve the minimum design depth.

The bottom of both the east and west channels were then covered with an average 3-inch thick layer of topsoil, seeded and covered with permanent turf reinforcement mat as discussed below. Large rock boulders in the size range of approximately 2 to 4 feet were placed within the East and West Channels at the outfalls from the Diversion Berms and at the end of each channel. These were placed by cutting the turf reinforcement mat and then pushing the boulders 4 to 6-inches below the existing grade.

Some side slope tension cracks and a side slope failure occurred on the West and East Channel side slopes during construction as discussed below in Section 5.1. This required redesign of the side slopes of these channels to achieve a stable slope. A portion of the inside slope of the East Channel required removal of near surface clay material, which had experienced slope movement, and replacement with compacted RF alluvium. Drainage gravel was placed in a portion of the West Channel invert to provide seep mitigation and portions of the side slopes in both channels were flatter than design (2:1) to provide stability in tension crack areas as discussed below in Section 5.1 (see As-Built Topographic Survey, map pocket and Record Drawings, Appendix H). Some seep areas with soft spots remain in the upstream portion of the East Channel and should be an inspection item during operations and maintenance.

The bottom widths of the channels vary from approximately 14 to 20 feet and the gradient of the channels averages approximately 12 percent, with some short reaches having gradients of approximately 13 percent. The extreme upstream portion of the west channel has a gradient of approximately 17 to 18 percent and the up-gradient end slope of both channels is approximately 2:1 per design. The end-of-channel outfall gradients vary from approximately 1 to 4 percent in the west and east channels, respectively, with the west channel having a small depression in the boulder area.

4.8 Revegetation at the OLF

Revegetation at the OLF began on the northwest area of the site above the first diversion berm following scarification of the surface to a depth of approximately 6 to 12 inches with a disk or ripper teeth followed by a disk. Seeding was performed by hand followed by straw crimping and hydraulically-applied "Flexterra" as discussed below in Section 4.9. The revegetation continued with the same procedure in between the berms throughout the site and on the top of the buttress.

4.9 Erosion Control

Erosion controls at the OLF include the use of straw crimping and a hydraulically-applied erosion control material known as "Flexterra". This material is a flexible growth medium

consisting of wood fibers, crimped interlocking fibers and additives. The straw crimping and Flexterra were placed on the 5.5:1 side slopes of the OLF cover. The Flexterra was placed at a rate of approximately 3,500 pounds per acre.

Biodegradable coconut fiber erosion control blankets, North American Green (NAG) C125 BN, were placed on the diversion berms on the OLF cover and permanent turf reinforcement mats (TRM) were placed in the east and west down slope outfall channels and on the lower 10 feet of the 3:1 buttress south slope (see As-Built Topographic Survey, map pocket). A heavier material (NAG P 550) was placed in the outfall channels and a NAG C 350 was placed on the bottom 10 vertical feet of the buttress south slope. The top portion of the buttress 3:1 slope was then covered with NAG C 125 and anchored per the manufacturer's recommendations. These materials were placed following seeding and stapled into the soils as required by the specifications. Various staples and anchor devices were used including steel "U" shaped wire, driven composite anchors and driven steel anchors with bolt washers on the top. In the rocky RF alluvium materials, the latter worked best at securing the materials.

Portions of the erosion control blankets on diversion berm No. 5 ignited during construction causing a fire throughout most of the berm and adjacent areas. This required removal of the burned erosion control material from that area with regrading portions of the diversion berm, reseeding and replacement of erosion control materials in that area.

Additional erosion controls, "Terra Tubes", were placed on the closure surface between the diversion berms as recommended by the manufacturer of the Flexterra material. These are elliptical biodegradable erosion-control tubes placed on the surface every 65 feet, approximately, on the closure surface. They are anchored with wood stakes every 2 feet on the downhill side and with metal stakes every one foot on the uphill side.

4.10 Installation of New Groundwater Monitoring Wells

Three downgradient groundwater monitoring wells were completed per Well Abandonment and Replacement Program (WARP) Work Plan Addendum Attachment 5 (July 28, 2005). These were completed to total depths of approximately 21 feet. The three wells were located at the east, middle and west toe of the buttress (see As-Built Topographic Survey, map pocket). The monitoring wells were installed in hollow-stem auger boreholes with total depths varying from approximately 20 to 21 feet below ground surface. The wells are screened approximately in the lower 15 feet, within weathered claystone and siltstone material. The weathered bedrock contact varies between approximately 4 to 8 feet below ground surface and the eastern well is the only well which contained groundwater at the time of installation.

The monitoring wells are constructed using 2-inch diameter PVC pipe (Sch. 40) with slots in the screened zones of 0.01 inch width, threaded end sump caps and 16/40 silica sand filter pack. Bentonite pellets (1/4-inch) were used in the bottom of each well below the filter pack and in the top seal which is the upper 4 to 4.5 feet of the wells. The surface PVC casings extend approximately 2.5 feet above the ground surface and the locking 5 by 5-inch square protective steel casings extend 3 feet above the ground surface. The protective steel casings are anchored

in concrete approximately 1.6 to 1.9 feet below ground surface. Well pads consist of 3 by 3-feet square concrete pads. The boring logs and well completion details are found in Appendix J.

4.11 Summary of Material Quantities

The following materials were included at the OLF closure:

General Material Identification	Material Placement/Removal	Material Specifications	Material Quantity
Earthwork	Excavation at Buttress foundation	Topsoil	10,019 yd^2
	Regrade in Buttress Area	Native Soil	6,970 yd^2
	Drain Rock in Buttress	Minimum 0.8 feet Thick Layer Drainage Rock	6,459 yd^3
	Compacted Buttress Fill	Approved Imported Pit Fines	44,854 yd^3
	Regrade at OLF	Native Soil	49,852 yd^2
	Regrade Fill at OLF	RFA and/or Pioneer Pit Fines	44,000 yd^3
	Cover Soil at OLF	RFA	39,126 yd^3
	Diversion Berms on OLF Cover	RFA	5,530 lf
	Down Slope Outfall Channels	Native Material	1,432 lf
	Boulders in Outfall Channels	24 inch minimum diameter boulders	91 total
Geosynthetics	Geogrid below buttress	Biaxial geogrid	10,019 yd^2
	Geotextile over Buttress Drain Rock	8 oz. nonwoven geotextile	16,988 yd^2
	Georidge in Diversion Berms	Georidge Check Dams	651 lf
Re-vegetation and Erosion Control Matting	NAG C125BN	Biodegradable Coconut Mat	18,457 yd^2
	NAG P550	Permanent Turf Reinforcement Mat	3,706 yd^2
	NAG C350	Permanent Turf Reinforcement Mat	9,504 yd^2
	NAG C125	Temporary Coconut Mat	6,624 yd^2
	Flexterra and Crimped Straw	2 directional crimped straw with hydraulically applied matting	82,993 yd^2
	Revegetation at OLF and Buttress	Rocky Flats Native Seed Mix	25.1 acres

RFA = Rocky Flats Alluvium
NAG = North American Green
yd^3 = cubic yard
oz. = ounce
yd^2 = square yard
lf = lineal feet

5.0 DESIGN AND FIELD CHANGES DURING CONSTRUCTION

This section presents a summary of the design and field issues and resolutions during construction. Summaries of the design changes, clarifications and revisions during construction as well as the field changes are also included.

Design changes are those changes for which the plans and/or specifications were revised by the project design team with approval by the RM and review by the CQAE. Design changes and clarifications are recorded primarily in the Engineering Change Request (ECRs; Appendix E.2), which are also approved by the CDPHE.

Field changes are those changes which were initiated primarily by the construction contractor or jointly by the contractor and design team with approval by the design team and the RM with review by the CQAE. These field changes are documented in the RFIs (Appendix E.1) or in the daily construction records (Appendices F.1 and G.1). The RFIs are also summarized in this section.

5.1 Field Issues and Resolutions

Various field issues were encountered during construction of the OLF closure which required resolution between the various parties. These included the following:

Various soils materials used for the OLF closure did not all meet the specifications for grain size analyses, notably the pit fines used in buttress construction and drain rock used beneath the buttress fill. Because of variations in procedures used in development of the soils at the sources, some of the materials were slightly out of specification for some of the specified grain sizes. Because these materials met the general soils types required for the project, various applicable performance tests were performed to verify that the materials could be used in the construction. The most important design criteria for pit fines used in the buttress fill is the in-place, compacted strength of the materials. Therefore, materials not meeting grain size analyses requirements were remolded in the laboratory for triaxial strength tests. Such tests verified that the compacted materials would meet or exceed the design requirements for the buttress fill. Therefore, the use of such materials was allowed in the buttress fill.

The gravel material used at the base of the buttress fill for drainage was also slightly out of specification for grain size analyses. Following handling and placement, portions of this material contained more fines than specified. Therefore, both QC and QA tests were performed, as discussed below in Section 6, to verify that the material was acceptable for use beneath the buttress. These tests indicated that the materials sampled from the site placement would exceed the design permeability by more than one order of magnitude. Therefore, the use of these drainage gravel materials was acceptable.

The relatively fine-grained valley alluvium subsurface materials beneath the buttress fill serve as the infiltration from the drain rock layer beneath the buttress as shown on Dwg. 011. A question was raised by regulatory oversight during construction regarding the infiltration capacity of this

material. Therefore, test pits were excavated and field infiltration percolation tests were performed on these in-situ materials. These tests verified that the existing subsurface materials would have the capacity to receive the design drainage from the drain rock layer beneath the buttress.

An active high-pressure natural gas line, owned by XCEL Energy, is present along the north side of the OLF. During construction, this gas line was staked to pass through the previously-marked waste area of the OLF. Therefore, a series of test pits was excavated between the north edge of the OLF and the gas line to verify that the upper one foot of existing grade material within the gas line right-of-way does not contain waste. Therefore, it was determined by K-H that it would not be necessary to either move the gas line or relocate waste in this area. EPA and CDPHE also witnessed the test pit excavations and verbally gave approval.

A total of seven seeps were noted along the east, west and central portions of the OLF closure. Seeps 1 through 3 and 6 were located on the East OLF area while Seeps 4, 5 and 7 were located in the West OLF area. One seep area (Seep No. 4) was noted along the final grade of the OLF at a location in the western (downstream) portion surface Diversion Berm Number 3 (Figure 3). This area required stabilization for long-term stability of the diversion berm. This required the design of a subsurface drainage/stabilization trench. The drainage/stabilization trench was in the shape of a "T" to capture the groundwater flow and discharge it into the buttress drainage rock. Six-inch (D50) riprap rock was placed at the bottom of the trench which was wrapped in non-woven (8 oz/sy) geotextile. The remainder of the trench was then backfilled using RF alluvium. The trench was built in accordance with the design submitted by Earth Tech in ECR Number 12.

One additional seep was noted just below the beginning of Diversion Berm Number 3 and just upstream of the beginning of Diversion Berm Number 7 (Seep No. 7, Figure 3). The EPA and CDPHE required mitigation of this seep. Therefore, a subsurface drainage/stabilization trench was constructed at this seep area similar to that described above for the western portion of Diversion Berm No. 3. This trench extended approximately 80 feet from the beginning of the seep area to the buttress drainage rock and varied in depth from approximately 3 feet at the beginning to approximately 5 feet at the tie-in to the buttress drainage rock.

During construction, the excavated side slopes of the Drainage Outfall Channels experienced tension cracks (West Channel, Seep 5) and embankment failure (East Channel, Seep 6). This condition followed a relatively heavy rain the previous week and may also have resulted from areas of seepage along the cut slopes. Therefore, it was necessary to pothole in the locations of instability. The Designers (Earth Tech) determined that the instability was attributed to the weathered claystone in the slope cross-section. Therefore, the Designers decided to remove the weathered claystone from the East Channel area at Seep 6 and replace it with RF alluvium. Additionally the slope on the East Channel has been excavated to a 4:1 slope, approximately. A wet area upstream of the tension crack which developed in the West Channel (Seep 5) was also potholed. A large amount of groundwater was flowing into this pothole. The Designers decided to place a one foot deep layer of 6-inch rock wrapped in non-woven (8 oz/sy) geotextile at the bottom of the excavation and backfill the remainder of the excavation with RF alluvium. The Designers performed slope stability calculations at these locations to verify that the field changes are sufficiently stable and they also performed a stability analysis of the 2:1 slope at the

beginning of the East Channel due to observations of wet spots at the toe of the slope. Such stability analyses are presented in Appendix K.

5.2 Engineering Change Requests

A total of thirteen Engineering Change Requests (ECRs) were issued during the construction period to provide a change in the design or specifications to allow use of various materials in the construction and to provide for changed conditions. The ECRs typically required approval by the Designer of Record (Earth Tech) with review by DOE and review/signoff by the RM, CQAE and CDPHE. The following summarizes the ECRs for the OLF:

ECR No.	Description	Date	
		Submitted	Approved
1	Pit Fines for regrade	5/17/05	5/19/05
2	Continue 2' cover down the buttress side slope	5/18/05	6/1/05
3	Eliminate sand cone testing on buttress fill	5/24/05	Cancelled – 7/13/05
4	The limit of waste within the existing gas line easement	6/1/05	Cancelled - 6/7/05
5	Change the required tolerances for the drain rock thickness to a minimum of 0.8 feet and an average greater than 1 foot.	6/9/05	6/15/05
6	Eliminate the need for LA abrasion, sodium sulfate soundness and absorption testing for the drain rock	6/17/05	6/22/05
7	Approval of the in-place drain rock based upon permeability testing	6/17/05	6/22/05
8	Change to the Seeding Specifications: SPEC-02900-0990	6/21/05	7/13/05
9	Approval of in-place geotextile based upon permeability and puncture strength testing	7/6/05	7/13/05
10	Re-alignment of the east access road	7/7/05	7/20/05
11	Additional Design analysis to verify an adequate design height for the diversion berms	8/8/05	9/12/05
12	Seep Remediation Trench design for the seep under Diversion Berm #3	7/28/05	9/12/05
13	Seep Remediation Trench design for Seep No. 7	9/7/05	9/12/05

The first ECR was issued to allow use of pit fines from the Pioneer Sand Company facility south of the site. Based on material grain size analyses, compaction curve and Atterberg Limits test and a field test section, this material was allowed for use in the regrade material along with the originally specified RF alluvium.

The second ECR was issued to provide for a changed 3:1 slope of the buttress fill to replace the upper 2 feet of buttress fill with RF alluvium so that the RF alluvium covers the entire OLF including the buttress.

The third ECR was issued to allow a change in the testing requirements of the compacted buttress fill to allow reduction or elimination of the sand cone tests, and to use oven moisture tests in addition to the nuclear density gage tests. This ECR was later cancelled as the sand cone tests were performed and indicated good correlation with the nuclear gage tests.

The fourth ECR was issued to provide any necessary redesign of the north edge of the OLF closure due to the proximity of the active gas line. However, following test pit excavations as discussed above, it was determined that this would not be necessary and this ECR was subsequently cancelled.

The fifth ECR was issued to provide a tolerance on the placement of the drain rock under the buttress fill. The requirements of Specification Section 02222, 3.02 were changed to allow a tolerance of minus 0.2 ft or a minimum thickness of 0.8 ft with an average thickness of at least 1.0 ft as designed.

The sixth ECR was issued to eliminate some of the drain rock testing requirements as listed in Table 7.1 of the QA/QC Plan (Appendix B). These tests include LA Abrasion, Sodium Sulfate Soundness and Absorption which are generally required for rock materials either subject to repeated loadings such as beneath roadways or in surface applications where weatherability is more important. Because the materials used for drain rock are in a buried application and because they are a durable, hard, dense gravel, the additional tests were not required.

The seventh ECR was issued to verify that the drain rock used in the project was capable of performing as designed within the structure. This was required because portions of the drain rock were slightly out-of-specification for grain size. Therefore, constant-head permeability tests were performed by both QC and QA which verified that the materials were at least one-order of magnitude more permeable than the design requirements.

The eighth ECR was issued to revise the Seeding Specification Section 02900 to provide for revisions in the topsoil placement, seeding and erosion control systems at the OLF. The original specifications indicated that the bottom valley alluvium removed from the buttress area stripping was to be used over the entire OLF cover. Following recommendations from the EPA's revegetation expert this material was placed instead over the top of the regrade fill at the base of the 2-foot RF alluvium soil cover and the remaining topsoils stripped from other portions of the OLF were used on portions of the cover containing permanent turf reinforcement mat. The originally specified biodegradable erosion mat on the OLF surface was changed to a

specification requiring straw crimping followed by a sprayed-on flexible growth medium with the use of biosol to enhance seed germination.

The ninth ECR was issued to allow use of the non-woven geotextile between the drain rock and buttress fill. Although the average mass per unit area of these materials were less than the specified minimum of 8 oz/sy, the important performance tests for apparent opening size, permeability and puncture strength averaged in excess of the specifications based on QA testing. Therefore, this material was approved for use in the closure.

The tenth ECR was issued to realign the East Access Road east of the East Drainage Channel. This also included construction of an East Subsurface Drain to divert observed groundwater east of the OLF into the SID. This ECR was deemed to be outside of the design scope of the OLF and therefore did not require the Designer's approval.

The eleventh ECR was issued to verify an adequate design height of the diversion berms. While providing control points for the contractor for the diversion berms it was discovered that the diversion berms were only 2 feet tall from the centerline of flow to the top of the diversion berm. This was attributed to the original design. The calculations for the depth of flow caused by the design rain events would have produced maximum depth of flow of approximately 1.67-feet. Therefore, originally Earth Tech conservatively chose a depth of flow of 2-feet and then added a 1-foot freeboard resulting in berms that were 3 feet tall. However they did not account for the 18% slope of the cover which geometrically results in a 2-foot tall berm. A 2-foot tall berm reduces the freeboard to 0.33 feet, which was deemed adequate by Earth Tech following additional analysis.

The twelfth ECR was issued to provide subsurface stability of the diversion berm where a surface seep created a soft spot under Diversion Berm No. 3 (Seep 4). The trench was designed to capture the groundwater flow and discharge it into the buttress drain rock preventing saturation of the berm and the cover supporting the berm.

The thirteenth ECR was issued to provide additional seep mitigation below the east end of Diversion Berm No. 3 (Seep 7). This design was similar to that provided in ECR No. 12 and included capture of groundwater flow with discharge into the buttress drain rock preventing saturation of the soil cover and potential instability of the adjacent diversion berms in that area.

5.3 Field Changes

Various field changes were performed during construction, some of which were discussed above in Section 5.1.

Various field adjustments were made to the OLF closure grades and dimensions during construction based on location of wastes and survey data variations. A modification of the surface grades was made at the north end of the OLF central swale to raise the grade to avoid waste materials.

Construction at the west edge of the buttress fill included placement of drain rock approximately 8 feet higher than design because of an error in the original topographic map. When this problem was field adjusted using correct survey information, approximately 100 lineal feet of such drain rock was removed along with the overlying geotextile. One additional width of geotextile was placed at the new location over the edge of the drain rock and anchored as designed.

Waste materials were encountered in the lower central portion of the OLF closure following completion of the majority of the grading fill. In order to avoid removal of these wastes, as required by health and safety protocol, a field change was made to allow the elimination of grading fill over this area with placement of the 2-foot thick RF alluvium soil cover over an area of approximately one acre.

A seep was located east of the OLF in the vicinity of the SID which had a relatively constant flow rate estimated at approximately 10 to 20 gallons per minute (gpm). This seep had reportedly been intercepted and diverted under the temporary east access road with a subsurface "French drain" with gravel in a trench. This seep remained following closure of water and other pipelines at the site and is believed to be groundwater flowing on top of a caliche layer. In order to keep this seep out of the east drainage channel and away from any interaction with the OLF, a subsurface drain was installed to provide discharge of this seepage into the SID east of the outfall channel and adjacent access road. A series of three test pits were excavated above the seepage area to determine the depth and extent of the seepage. These indicated that water was flowing through an approximately 1-foot thick zone at a depth of approximately 8 to 10 feet below ground surface. Therefore, an additional subsurface drain was installed to divert this flow up-gradient under the road to the east. This east subsurface drain (ESD) consists of drainage gravel placed in an approximately 12 to 14-foot deep by 5 to 6-foot wide trench to divert the flow east of the new access road into the SID. Rock was placed at the outfall into the SID. A profile of the ESD is presented in Appendix G.1 (July 15, 2005).

Minor amounts of construction debris including broken concrete and a portion of the old, abandoned gas pipeline were encountered in the east-central portion of the OLF during final grading and placement of the cover. This material was removed from the site and disposed of offsite as municipal solid waste to provide for construction to design grades in this area.

Various portions of diversion berms (No. 3, 6 and 7) were realigned from original design near the downstream outfalls to provide a slope of at least 2 to 5 percent required by design.

5.4 Requests for Information

The following nineteen RFIs were issued for construction of the OLF:

RFI No.	Description	Date	
		Submitted	Approved
1	Clarify the required thickness of the drain rock	5/16/05	5/16/05
2	Clarify the required depth of excavation for the buttress footprint	5/16/05	5/16/05
3	Request to anchor the geogrid below existing elevation to prevent UV deterioration	5/16/05	5/16/05
4	Request to use Syntech Technical Fabrics SF 12 geogrid	5/17/05	5/17/05
5	Change the horizontal tolerance to +/- 0.5 feet on the buttress tow	5/24/05	5/25/05
6	Request to anchor geotextile by using buttress drain rock	5/24/05	6/1/05
7	Request to use Economy Road base as regrade fill	5/27/05	6/15/05
8	Clarify Regrade and Cover in the vicinity of the active gas line	6/7/05	6/8/05
9	Request for additional control points at the north edge of the buttress tie-in	6/16/05	6/20/05
10	Request to change the elevation of the grade break points	7/6/05	7/13/05
11	Clarification for the need to excavate to subgrade 1	7/20/05	7/20/05
12	Request to field fit the alignment of the diversion berms so they will drain as intended	7/20/05	7/20/05
13	Request to grade the back (down hill) slope of the diversion berm flatter than 2:1, and field fit the ends of the channels	7/25/05	7/27/05
14	Request design for areas where the diversion berms intersect a seep	7/28/05	Changed to ECR #12
15	Request to use different staples for the erosion matting	7/28/05	8/3/05
16	Request to anchor the erosion matting adjacent to the channel side slope as per the manufacturers recommendation	8/3/05	8/3/05
17	Clarify the type of temporary erosion matting to be used on the top half of the buttress 3:1 slope	8/17/05	9/12/05
18	Request to adjust control point 1251 to allow a 2 foot cover of the buttress pit fines over the drain rock and still allow the area to drain	8/17/05	9/12/05
19	Request approval of C 125 as equivalent erosion matting as C 125 BN for use on Diversion Berms	8/30/05	8/30/05

The first two RFI's involved the buttress area to clarify the required thickness of the drain rock layer and to provide guidance where the thickness was greater than 2 feet.

The next two RFI's involved the geogrid material to provide acceptance of a different type geogrid than originally specified and to clarify anchorage requirements. The differing geogrid material had manufacturer's quality control (MQC) strength tests equal to or exceeding the originally-specified geogrid material.

The fifth RFI was issued to clarify the tolerance for the toe of the buttress fill as specified in Specification Section 02221, Part 3.03A, and the sixth RFI was issued to provide clarification of the geotextile anchor on Dwg. 011.

The seventh RFI was issued for additional clarification of earthwork for the regrade material as defined in Specification Section 02221, Part 1.02B. The eighth RFI was issued for minor grade tie-in clarifications near the gas line as shown on Dwg. 006.

The ninth RFI was issued for clarification of the buttress back slope as shown on Dwg. 003, and the tenth RFI was issued for modification of the grade break in the central portion of the OLF as shown on Dwg. 007.

The eleventh RFI was issued for verification of subgrade 2 requirements in the area with waste near the surface as shown on Dwg. 005, and the twelfth RFI was issued for clarification of a minor grade change at the west end of diversion berm 3 as shown on Dwg. 009.

The thirteenth RFI was issued for clarification of the channel elevations and diversion berm slopes to allow a flatter 3:1 downhill slope for constructability rather than 2:1 as designed, and the fourteenth RFI was issued to provide guidance on stabilizing wet seep areas over which diversion berms are constructed. This required use of geotextile around subsurface drainage gravel to prevent the saturation of the berms by the seeps. This RFI was later replaced by ECR No. 11.

The fifteenth RFI was issued to allow use of a different type of anchor for the erosion control mats to use metal spikes with washers rather than staples in the rocky soil, which provided better anchorage of the erosion mats. The sixteenth RFI was issued to provide clarification of the diversion channel TRM anchor to allow a minimum 1 foot anchor beyond the edge of the slope and to provide a minimum height of 2 feet in the channels (above the maximum flood water surface). The seventeenth RFI was issued to clarify which temporary erosion matting to use on the buttress side slope above the bottom 10 vertical feet of the 3:1 slope.

The eighteenth RFI was issued to allow survey control point 1251 (final control point 99870) to be raised to provide a 2-foot cover of buttress pit fines over the drain rock and still maintain the proper drainage in the vicinity.

The nineteenth RFI was issued to allow NAG C 125 to be used on the remaining berms since NAG C 125 BN was not available. The Designers determined that C 125 was technically equivalent to C 125 BN, and stated that C 125 could be used upon approval from U.S. Fish and

Wildlife. The U.S. Fish and Wildlife approved the C 125 in an e-mail dated November 14, 2005 and is attached to the RFI.

6.0 QUALITY CONTROL AND QUALITY ASSURANCE DURING CONSTRUCTION

This section presents the quality control and quality assurance procedures performed for the construction of the OLF accelerated action closure. As discussed above in Section 1.4, construction quality control (QC) was performed by Golder on behalf of K-H and Envirocon and construction quality assurance (QA) was performed by Tetra Tech.

All QA/QC was performed in accordance with the QA/QC Plan (Appendix B) and in general conformance with industry accepted standards (ASTM). An overall summary of field QA and QC tests performed at the OLF is presented in Table 6.1.

6.1 Quality Control

Construction QC was performed for major construction activities performed at the site including earthwork, geosynthetics installations, seeding and all associated construction. Two weeks of construction QC services were on an as-needed basis. Record surveys were prepared continuously and monthly record survey drawings were developed. All QC at the site was overseen by construction quality assurance personnel as discussed below in Section 6.2. The construction QC records are presented in Appendix F.

6.1.1 QC Inspections and Reports

Daily QC inspections were performed during the OLF closure and daily reports prepared by Golder are presented in Appendix F.1.

6.1.2 QC for Materials

All materials delivered to the site were first inspected and logged by QC personnel. This included the geosynthetics for the buttress, erosion control materials, seed and all associated materials. Delivery documentation and manufacturer's quality control (MQC) data delivered to the site along with the various roll goods and other material deliveries were reviewed by QC personnel. Such information was then passed along to the QA personnel for verification of conformance with project requirements and specifications

6.1.3 QC for Earthwork

Construction QC for earthwork included performance of all necessary tests required by Table 7.1 of the QA/QC Plan (Appendix B). This required field inspections, field tests and laboratory tests

for the RF alluvium used for regrading and cover soils, the buttress fill soils and the drain rock layer materials. Such field and laboratory tests and logs are presented in Appendix F.2.

The QC inspections focused on adequate lift thickness, moisture content and sufficient passes of the large sheepsfoot compactor. Grain size analyses (GSA) were performed for various sources of the RF alluvium based on ASTM D 422 in combination with ASTM D 5519. A total of four QC tests were performed on RF alluvium and four QC tests were performed on Pioneer Pit fines used as compacted grading fill soil.

The RF alluvium used for the top two feet of cover soil was tested by ASTM D 422 as well as field tests utilizing ASTM D 422 in combination with ASTM D 5519 to characterize the overall grain size of the placed material. This included a total of eight QC tests on the OLF cover soils. The QA/QC Plan required a total of six tests based on a total RFA cover soil volume of 39,000 cy and a frequency of one test every 6,500 cy. However, with ECR 002 the cover fill was extended down the 3:1 buttress slope adding an additional 6,840 cy, which required two additional tests.

A summary of QC soils index tests for compacted fine-grained cushion soils is presented in Table 6.2. Field compaction tests were performed on the buttress fill soil regularly for all buttress soil placed and compacted. The locations of these tests are presented on Record Drawing Sheet 7 of 7 (Appendix H). This included 280 nuclear gage tests and 14 sand cone tests to verify the accuracy of the nuclear gage (Table 6.3). The QA/QC Plan required a total of 280 compaction tests based on one test for every 5,000 square feet per lift of compacted buttress fill soil. The average compaction of buttress soils was approximately 99 percent of the maximum dry density as determined by the Standard Proctor Density Test (ASTM D 698). The sand cone tests were similar to the nuclear density tests and indicated an average compaction of the buttress soils in excess of 100 percent of the maximum dry density. Various tests on the compacted buttress fill soils failed for moisture content (typically too wet) or for compaction. For each failing QC test, the material was reworked by air drying, recompaction or both and at least one additional passing QC test was documented at that location. To provide conservatism in QC testing several areas had two passing tests, however only one subsequent passing test is required for each failing test. Two tests which were out of specification for moisture content and one test was out of specification for compacted dry density did not have retests. These are discussed in the non-conformance Section 6.3.

6.1.4 QC Record Surveying

Continuous QC surveying was performed during construction to set grades and stakes to guide the earthwork operators and to verify that design grades and layer thicknesses were achieved following construction of various sections.

Monthly intermediate record survey drawings were developed for the subgrade surfaces, top of drainage rock, top of buttress fill, top of cover soil layers, drainage berms, seeps and erosion control mats to verify layer thicknesses, grades and locations. The final Record Drawings are presented in Appendix H and the final As-Built Topography at the OLF is presented in the map

pocket (Volume 1). Soil test locations are also indicated on the record survey drawings (Sheet 7 of 7, Appendix H).

6.2 Quality Assurance

Construction QA was performed continuously during the OLF closure to provide assurance that the construction and testing was performed in accordance with the final design plans, specifications, approved field and design changes during construction and in accordance with the final QA/QC Plan. Some of the QC survey data was not readily available to QA during the latter portions of the construction, but was eventually reviewed and was determined to be acceptable. All QA reports and documentation are presented in Appendix G.

6.2.1 QA Inspections and QC Review

Construction QA inspections were performed daily during each shift to provide oversight of all construction activities associated with the OLF closure. All QC reports and tests were reviewed by the SQAM and various approvals were signed in the field by the SQAM for the CQA team. Daily QA reports were prepared as were weekly and monthly reports. Field changes and daily construction decisions regarding earthwork, geotextiles and other materials were reviewed by the SQAM.

6.2.2 QA Review of RFIs, ECRs and Submittals

The CQAE reviewed all technical RFIs and submittals for conformance with the specifications and QA/QC plan. All such RFIs and submittals were approved by the RM with concurrence signoff by the CQAE. Various RFIs or submittals proposing construction methods or materials differing from the design and QA/QC documents were also reviewed by the design team with review by the CQAE and approval by the RM.

The ECRs were initiated by the contractor with primary response from the design team with review by the CQAE, RM, DOE and approval by the CDPHE.

The submittals were reviewed by the CQAE and RM for conformance with the specifications and QA/QC Plan. Some material submittals, such as the geogrid used in the buttress foundation, were submitted as RFIs by the contractor, which were also reviewed as discussed above in Section 5.4.

The CQA team reviewed earlier survey data from the QC surveyors. However, during the latter portions of the construction, QA did not review all survey data but received final survey data and information only through the RM for K-H at the direction of the RM.

6.2.3 QA Field and Laboratory Testing

The CQA team performed field and laboratory testing of various soils and geotextiles during construction as required by the QA/QC Plan. These included periodic moisture-density tests of compacted fill in the buttress, field gradation tests of the RF alluvium and laboratory testing of buttress soils and drainage gravel materials.

A total of 14 QA field moisture-density tests were performed for compacted buttress fill soils using the nuclear density equipment, along with one sand cone test to verify the accuracy of the nuclear gage. All tests indicated moisture and compaction within specifications with an average compacted density in excess of 100 percent of the maximum dry density as determined by the Standard Proctor Test (ASTM D 698) and all were within plus or minus 2 percent of optimum moisture content.

The non-woven geotextile placed over the drain rock in the buttress was observed during initial installation to have visual irregularities between various sections. Therefore a series of QA tests were performed (not defined in the QA/QC Plan) to determine if this material would be acceptable for use in the constructed facility. The most important performance criteria for this geotextile were permeability and puncture strength with an index requirement for mass per unit area. The average mass per unit area was less than the minimum specified. However, the most important performance criterion of permeability and apparent opening size was exceeded for all samples tested and the average puncture strength exceeded the specified requirements. Therefore, this non-woven geotextile material was accepted for use in the OLF.

6.3 Non-Conformances and Resolutions

Various non-conformances with the Final Design Plans and Specifications and/or Final QA/QC Plan occurred during the course of the project. This section briefly discusses such non-conformances and the resolution to each non-conformance. Some of the issues discussed in this section are also addressed elsewhere in this CCCR, and references are made to the section(s) in which the issues are discussed.

Two earthwork material non-conformances occurred during the project, one related to the drainage rock gradation and one related to the buttress fill gradation. As discussed above in Section 5.2 the drain rock gradation was out of specification (Section 02222, Part 2.01A.1) for a portion of the materials. The most important performance requirement of the drain rock is drainage capacity. Therefore, based on laboratory permeability testing of the drain rock materials, they were approved by the designers for use in the drainage rock layer of the buttress. The gradation of the pit fines used as compacted buttress fill did not meet the specifications (Section 02221, Part 3.06A.5). The most important performance requirement of the compacted buttress fill material is in-place shear strength. Therefore, based on laboratory triaxial strength tests of remolded pit fines, the materials were approved by the designers for use in the compacted buttress fill.

Three compaction tests performed for the buttress fill were out of specification, two for moisture content and one for compacted dry density. The two tests out of specification for moisture content (QC-BF-DT-34 and -225) were 0.3 to 0.4 percent over the specified limit of 2 percent wet of the optimum moisture content. The most important criteria for compacted fill for the buttress is the compacted density. Both of these tests met the specifications for compacted density with 97 to 98 percent of the required maximum dry density (MDD). The one test which did not meet specifications for compacted density (QC-BF-34-79) had a density of 93 percent of the MDD with a moisture content of 0.3 percent above optimum (within specifications). This test was the only one not meeting the required density out of 280 QC tests and 14 QA tests. The average compacted density of all buttress fill tests was in excess of 98 percent of the MDD. Therefore, the three non-conforming compaction tests, only one of which did not meet the required dry density, will not affect the overall constructed integrity of the buttress.

One geosynthetic material non-conformance occurred during the project. Some of the non-woven geotextile used over the drain rock in the buttress did not meet specification for mass per unit area (Section 02223, Part 2.01D). The most important performance characteristics of this geotextile are the permeability, water flow rate and puncture strength. Based on QA laboratory tests performed on this geotextile, as discussed above in Section 6.2.3, the materials met or exceeded the performance test criteria. Therefore, the non-woven geotextile materials were approved by the Designer and CQAE for use in the buttress.

One construction method non-conformance occurred during the project. Placement of approximately one-half of the regrade fill using the RF alluvium was required by specification (Section 02221, Part 3.05A.3, and Section 01110, Part 1.01A.3) to have a test pad prior to placement of compacted regrade material. Additional pit fines materials used for approximately one-half of the regrade were obtained from the Pioneer Sand Company which were subjected to a test fill pad as required by specifications, as discussed above in Section 4.5. Typically the CAT 815 and 825 machines were used together to achieve the required minimum of 4 passes for both the RF alluvium and Pioneer Pit fines. Partially based upon a test pad performed for the PLF (using a CAT 825 where test pits were excavated into compacted RF alluvium and a loaded scraper was subsequently used to verify less than 1-inch deflection) the placement and compaction procedures established at the OLF for the same RF alluvium material were judged by CQA to be adequate to achieve the required shear strength of the material. Typically, RF alluvium when even moderately compacted will achieve both high internal friction angles and cohesion because of the nature of the material containing both rock fragments up to 12 inches and silt to clay size fractions. Based upon field visual assessments of compacted RF alluvium fill materials, the use of both the CAT 815 and CAT 825 compactors was determined to be acceptable when at least 4 passes was achieved.

A few construction grade tolerances were exceeded in portions of the surface diversion ditches adjacent to the diversion berms on the closure surface. A few localized areas had gradients less than the designed minimum gradient of 2 percent and one short reach had a gradient in excess of 5 percent. The drainage capacity of each diversion ditch is primarily dependent upon the overall gradients rather than localized gradients. The overall diversion ditch gradients were then

examined to verify that the overall gradient of each ditch was within the specified range of 2 to 5 percent. The average gradient of the diversion ditches ranged between 2 and 3.6 percent excluding berm number 4. The average gradient of berm number 4 was 6 percent. The high average gradient of berm number 4 was due to the steep gradient on the east end of the berm which was approximately 12 percent. This area of the berm was consequently covered with NAG P 550 turf reinforcement mat. Preliminary survey data showed an average gradient along the remainder of berm number 4 to be approximately 2 percent. A few areas of the diversion berm heights with respect to the invert of the adjacent drainage ditch were less than the specified 2 feet. However, some areas had diversion berm heights in excess of 3 feet and the average height ranged between 2.0 and 2.2 feet.

One construction profile grade at the discharge outfall of the West Channel did not meet specifications and a small depression exists at that location (Station 7+00, As-Built Dwgs. 008 and 009). This is in the area where the downstream energy dissipation boulders were placed and results in a depression of less than 1.5 feet. This small depression will actually serve to better dissipate high velocity storm flows from the channel and the overall gradient through this area (upstream and downstream of depression) is still in excess of 1 percent (see As-Built Topographic Survey). Therefore, this grade tolerance non-conformance will not reduce the flow capacity of this channel and is acceptable.

The thickness of the drain rock layer beneath the buttress had a tolerance of minus 0.2 ft from the specified thickness of 1 foot (see ECR No. 5). Two surveyed points had thicknesses of 0.7 ft, which were out of compliance with the specifications and ECR No. 5. The average thickness of the drain rock layer was approximately 1.3 feet and the hydraulic conductivity of the drain rock was well in excess of design requirements, as discussed above in Section 5.1. Therefore, the overall drain rock placement is adequate to meet the intent of the specifications.

Portions of the final cover thickness, measured prior to ripping and disking and placement of the diversion berms, indicated slightly less than the 2-foot cover thickness measured vertically between the "regrade 2" and the final surface. These were in the range of approximately 1.96 to 1.98 feet, less than 7 percent of which were out of compliance with the 2 foot requirement. When rounded off to the nearest tenth of a foot, these were recorded as 2.0 feet on the Record Drawings (Appendix H). Recording the thicknesses to the nearest 0.1 foot is in compliance with the specifications (Spec. Section 01310, Part 3.02A.1). A number of the thicknesses were measured slightly in excess of 2.2 feet and the average of all the measurements indicated that the 2-feet vertical cover soil thickness specified was met.

One procedural non-conformance with the specifications (Section 01100, Part 1.05E) and QA/QC Plan occurred during the project. Quality control personnel were not on site between July 28 and August 9. Quality assurance personnel remained on the site full time during this period. A statement is provided in the QC daily reports (Appendix F.1) by the original QC firm covering the gap. Personnel from K-H and from International Engineering also provided QC during the project as reported in Appendix F.1. However the period from July 28 through August 9, 2005 did not have QC coverage.

7.0 CONSTRUCTION REPORTING RECORDS

This section summarizes the construction reporting for the OLF closure including the daily QA and QC reports, weekly and monthly QA reports, the QA/QC data documentation and the photographic log. Intermediate record QC surveys and storm water and Best Management Practice (BMP) records are also summarized in this section.

7.1 Daily Reports

Daily summary reports were maintained throughout the construction by both the QC and QA personnel. The QCSM for Golder prepared the QC daily reports and the SQAM or assistant SQAM for Tetra Tech prepared the QA daily reports.

7.1.1 Daily QC Reports

Daily QC reports included weather conditions, a summary of work performed and QC inspections and tests performed for each day. The daily QC reports included both shifts as necessary (except for the period between July 28 and August 9 as discussed above in Section 6.3). Available daily QC reports are presented in Appendix F.1.

7.1.2 Daily QA Reports

Daily QA reports for the initial weeks of construction included the hours of work, weather conditions, equipment onsite, a summary of the work performed that day as well as non-conforming work or material and follow-up inspections of previously reported deficiencies. Because only one construction shift was performed during the first 10 days, the QA reports were typically more concise. Subsequent daily QA reports through July included a summary of work during both shifts. The final work was performed with one shift as reported on the QA reports. The daily QA reports are presented in Appendix G.1.

7.1.3 Daily QA/QC Data

Daily QC data was maintained in ongoing logs of earthwork testing for the OLF by CQC personnel. Such data were copied and given regularly to the SQAM for review. The SQAM also maintained QA data for soils compaction tests, primarily of compacted buttress fill soils.

7.1.4 Photographic Log

Photographic logs were maintained by the construction contractor, K-H personnel and the SQAM on digital cameras to record all major components of the construction. A photographic log of the OLF closure is included in Appendix C.

7.2 Weekly QA Reports

Weekly QA reports were prepared by the SQAM and reviewed by the CQAE for discussion at the weekly site construction meetings every Wednesday. These weekly reports included a construction synopsis, non-conformances, intermediate record surveys, hold point/releases, CQA geosynthetic testing and materials received, CQA and CQC soil sampling and testing, meetings and CQA/CQC personnel on site. The weekly reports were signed by the SQAM and the CQAE. A total of fifteen weekly reports were prepared during the project and are included in Appendix G.2.

7.3 Monthly QA Reports

Monthly QA data reports were prepared by the SQAM and reviewed by the CQAE to summarize the soils, geosynthetic and survey QC and QA data generated each month. These included summary tables and detailed tables of soils testing. Intermediate record surveys of the various soil layers and geosynthetic liner system layers were also presented in the monthly QA data reports. The first monthly includes work during the first two weeks of construction from mid May through the end of May. A total of three monthly data summary reports were prepared through July. Appendix G.3 includes these monthly QA summary reports, while the various appendices (F.2 and G.5) of this CCCR include the data. The final data for the month of August are included in the appropriate appendices.

7.4 Intermediate and Final Record Surveys

The survey personnel for the construction QC team developed regular intermediate record surveys in both tabular form and on plan views. These were developed for earthwork surfaces such as the regrade, drain rock, buttress fill and cover soil layers. The intermediate record drawings included all soils test locations.

7.5 Storm Water and BMP Inspection Records

Storm water and BMP records were maintained during construction as necessary to record storm water events and condition of the various BMP devices installed for erosion control. All such data is found in the project files.

8.0 ENVIRONMENTAL MONITORING DURING CONSTRUCTION

Environmental monitoring during construction primarily consisted of air sampling conducted during the early phases of construction when an exclusion zone was present in the central portion of the OLF

8.1 Air Monitoring

Air monitoring included both personnel and area integrated air samples collected between May 19 and June 10, 2005 at the OLF. Samples were obtained at the Exclusion Zone (EZ) boundary and in the equipment cabs of personnel in Level C as discussed below. All samples were analyzed at a certified off-site industrial hygiene laboratory for metals.

The purpose of the radiological protection air sampling at the OLF was to document the absence of airborne radioactivity. Radiological engineering and operations evaluated the radioactivity levels (soil and waste) during the planning phases of the project and determined that there was no potential for airborne radioactivity to exceed the limit of 0.3 derived air concentration (DAC). Initially, radiological protection air sampling was performed during the OLF project excavation operations that had the potential to impact existing radioactive wastes. The results observed documented that there were no instances of elevated airborne radioactivity levels during the excavation operations observed. Radiological Protection air sampling was discontinued based on the negative data and the reduced hazard of contacting further waste materials. Results are presented in Appendix I.

8.2 Exclusion Zone and Site Requirements

During the early construction period an EZ was established within the central portion of the OLF closure. Workers in this EZ were required to be in Level C Personal Protective Equipment (PPE) with full face APR respirators equipped with P100/chemical cartridges, tyvek coveralls, booties, and nitrile gloves.

Based on the air monitoring data through June 10, the site was downgraded to all Level D requirements after that time.

9.0 PRE-FINAL AND FINAL INSPECTIONS

This section presents the pre-final and final inspections of the OLF Accelerated Action closure at RFETS performed in August and September 2005. The pre-final and final inspections were divided into the west and east zones of the OLF because the west portion was completed first.

9.1 Pre-Final Inspection and Punch List

The pre-final inspection was performed at the OLF west closure area on August 24, August 29 and September 6, 2005 with the DOE Rocky Flats Project Office, construction contractor (Envirocon), QC Personnel, RM, Designers and CQA personnel. Representatives of the regulatory agencies (EPA and CDPHE) were also present at the west OLF pre-final inspection.

Based on this inspection, a punch list was developed for the construction completion requirements at the west OLF including: repairing trackhoe ruts in flexterra material and cleaning flexterra from georidge, completion of backfill of west anchor trench in west channel, anchoring georidge in flow line of diversion ditches, improving transition grades across anchor trenches, repair of C125 erosion mat on 3:1 side slopes, repair of west anchor trench of C350 turf reinforcement mat on the buttress side slope and adding metal staples to the P550 TRM to reinforce plastic staples.

Pre-final inspection of the East OLF closure area was performed on September 6 and a few more punch lists were developed for completion of this area including resolution of the seep area below Diversion Berm No. 3 (Seep No. 7), verification of grades along portions of Diversion Berms 4 and 5, minor work at the Seep 3 area, repairs of erosion mats and housecleaning issues.

Based on CDPHE requirements regarding the seep below Diversion Berm No. 3 (Seep No. 7), a subsurface drain was installed to control this seep as discussed above in Section 5.2 (ECR No. 13).

9.2 Final Inspection

A final inspection of the East OLF was performed on September 12, 2005 with representatives from K-H, DOE and CDPHE. All regulatory issues related to the punch list were addressed at this final inspection. The Punch List documenting the final regulator walk-down is presented at the end of Appendix F-1.

10.0 REFERENCES

American Society of Testing and Materials, 2004. Annual Book of ASTM Standards, Volume 04.08 Soil and Rock and Volume 04.09 Geosynthetics, West Conshohocken, PA.

Earth Tech, Inc., 2005. Final Design Report and Design Calculation Documentation for the Accelerated Action for the Original Landfill at the Rocky Flats Environmental Technology Site, prepared for Kaiser-Hill Company and U.S. Department of Energy.

Kaiser-Hill Company, 2005. Final Interim Measure/Interim Remedial Action for the Original Landfill (Including IHSS Group SW-2; IHSS 115, Original Landfill and IHSS 196, Filter Backwash Pond) U.S Department of Energy Rocky Flats Project Office, March, 2005.

U.S. Environmental Protection Agency, 1993. Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities by David E. Daniel and Robert M. Koerner, Risk Reduction Engineering Laboratory, Office of Research and Development (EPA/600/R-93/182), Cincinnati, Ohio.

TABLE 6.1
SUMMARY OF QA/QC FIELD TESTS

Quality Control Item	QA/QC Item	QC Action	QA Action	QC Tests		QA Tests		Total Material Placed
				Required	Actual	Required	Actual	
Regrade & Cover Material	Atterberg Limits- *(ASTM D 4318);*	1/6,500 cy	1 per 20 QC	7 Regrade Material 6 Cover Material	8 Regrade Including: 4 RFA 4 Pit Fines 8 Cover (RFA)	1 Regrade Material 1 Cover Material	2 Regrade Including: 1 RFA 1 Pit Fines	44,000 cy Regrade Fill 39,126 cy RFA Cover Soil
	Sieve Analysis (with USCS Classification) *ASTM D 422 ASTM D 5519*	1/6,500 cy	1 per 20 QC	7 Regrade Material 6 Cover Material	8 Regrade Including: 4 RFA 4 Pit Fines 2 Cover (RFA)	1 Regrade Material 1 Cover Material	2 Regrade Including: 1 RFA 1 Pit Fines	44,000 cy Regrade Fill 39,126 cy RFA Cover Soil
Buttress Fill Material	Field Density *ASTM D 2922*	1/5,000 sqft/lift	1 per 20 QC	243	280 (+ Retests)	13	14 All of which passed	1,211,058 sqft/lift
	Field Density Verification ASTM D 1556 ASTM D 2167	1 per 20 Field Density Test	N/A	13	14	1	1	1,211,058 sqft/lift
	Atterberg Limits *ASTM D 4318*	1/6,500 cy	1 per 20 QC	7	9	1	3	44,854 cy
	Sieve Analysis (with USCS Classification) *ASTM D 422 ASTM D 5519*	1/6,500 cy	1 per 20 QC	7	9	1	3	44,854 cy
	Standard Proctor- *ASTM D 698*	1/6,500 cy	1 per 20 QC	7	9	1	3	44,854 cy
Drain Rock	Sieve Analysis (with USCS Classification) *ASTM D 136 ASTM D 5519*	1/6,500 cy	1 per 20 QC	1	4	1	1	6,459 cy
Geotextile	Unit Weight ASTM D 5261	1/100,000 sqft	1 per 20 QC	1	2 MQC Submittals	2	5	153,000 sqft

- QA was performed by Tetra Tech
- QC was performed by Golder and Associates
- Material placed was determined from survey information with the exception to the regrade fill which was estimated from truck loads.

Table 6.2 A
Summary of QC Laboratory Testing

Sample No.	Material Type	U.S.C.S. Soil Classification	Atterberg Limits			Grain Size Distribution			Standard Proctor		Location
			LL	PL	PI	% Finer 3/4"	% Finer #4	% Finer #200	DD (pcf)	MC(%)	
DR-1	Drain Rock	GP	--	--	--	17.0	6.5	2.8	--	--	Centenial
DR-2	Drain Rock	GP	--	--	--	25.0	11.1	4.7	--	--	Centenial
DR-3	Drain Rock	GP	--	--	--	28.4	14.0	5.9	--	--	Centenial
DR-4	Drain Rock	GP	--	--	--	27.3	11.4	4.5	--	--	Centenial
RF-1	Pit Fines	SC	30	18	12	99.9	93.8	29.2	--	--	Pioneer
RF-2	RFA	GC	38	18	20	70.8	52.7	20.4	--	--	Centenial
RF-3	RFA	--	--	--	--	50.6	33.6	13.2	--	--	Centenial
RF-4	Pit Fines	SC	36	19	17	100.0	83.3	24.5	--	--	Pioneer
RF-5	RFA	GC	45	18	27	56.6	37.8	14.2	--	--	Centenial
RF-6	Pit Fines	SC	36	17	19	98.9	94.2	28.4	120.4*	13.4*	Pioneer
RF-7	Pit Fines	SC	32	17	15	100.0	94.2	38.5	--	--	Pioneer
RF-8	RFA	GP-GC	45	18	27	49.4	33.6	10.9	--	--	Centenial
BF-1	Pit Fines	SC	30	18	12	100.0	85.3	29.4	121.9*	11.8*	Centennial
BF-2	Pit Fines	SC	49	17	32	100.0	86.5	28.4	121.5*	11.9*	Centennial
BF-3	Pit Fines	SC	50	17	33	100.0	82.7	27.5	123.4*	11.2*	Centennial
BF-4	Pit Fines	SC	41	16	25	100.0	81.2	28.1	126.9*	10.5*	LaFarge
BF-5	Pit Fines	SC	43	18	25	100.0	80.8	22.9	125.5*	10.2*	LaFarge
BF-6	Pit Fines	SC	42	15	27	100.0	83.7	24.1	121.3*	11.6*	LaFarge
BF-7	Pit Fines	SC	48	19	29	100.0	85.7	30.2	121.9*	11.6*	LaFarge
BF-8	Pit Fines	SC	41	15	26	100.0	82.5	27.1	123.5*	11.0*	LaFarge
BF-9	Pit Fines	SC	40	18	22	100.0	81.9	25.7	125.9*	10.3*	Pioneer/LaFarge
CF-01	RFA	GC	49	20	29	62.2	43.2	19.9	--	--	Centenial
CF-02	RFA	GW-GC	41	18	23	52.8	36.1	11.3	--	--	Centenial
CF-03	RFA	GC	41	20	21	58.6	37.6	13.8	--	--	Centenial
CF-04	RFA	GC	39	20	19	62.1	49.3	20.1	--	--	Centenial
CF-05	RFA	GW-GC	36	16	20	51.2	37.6	10	--	--	Centenial
CF-06	RFA	GC	43	15	28	48.2	33.7	12.9	--	--	Centenial
CF-07	RFA	--	51	17	34	50.1	32.2	10.9	--	--	Centenial
CF-08	RFA	--	45	16	29	50.2	32.9	11.5	--	--	Centenial

Notes:
LL = LIQUID LIMIT
PL = PLASTIC LIMIT
PI = PLASTIC INDEX
DD = Dry Density
MC = Optimum Moisture Content
RFA = Rocky Flats Alluvium

* PER ASTM D4718, Rock corrected values

Table 6.2 B
Summary of QA Laboratory Testing

Sample No.	Material Type	U.S.C.S. Soil Classification	Atterberg Limits			Grain Size Distribution			Standard Proctor		Location
			LL	PL	PI	% Finer 3/4"	% Finer #4	% Finer #200	DD (pcf)	MC (%)	
QA-DR-01	Drain Rock	-	-	-	-	6.5	3.3	1.6	-	-	Centennial
QA-RF-01	Pit Fines	SC	31	14	17	100.0	94.1	25.4	-	-	Pioneer
QA-RF-02	RFA	GC				56.9	37.8	10.9	-	-	Centennial
QA-BF-01	Pit Fines	SC	43	15	28	100.0	85.6	26.2	119.7	12.7	Centennial
QA-BF-02	Pit Fines	SC	42	13	29	100.0	80.3	23.1	123.5	10.7	Lafarge
QA-BF-03	Pit Fines	SC	36	14	23	100.0	89.8	26.6	123.2	11.4	Pioneer/Lafarge

Notes:

LL = LIQUID LIMIT
PL = PLASTIC LIMIT
PI = PLASTIC INDEX

DD = Dry Density
MC = Optimum Moisture Content
RFA = Rocky Flats Alluvium

Table 6.3
Summary of Field QC Compaction Tests

Date	Test #	Wet Density (pcf)	Dry Density (pcf)	Moisture Contents		Proctor Results		Sand Cone Results		-2 to 2	> 95%	Pass/Fail	Comments
				Field MC	Oven MC	Optimum MC	Maximum DD	MC	DD	% off MC	% Comp.		
6/13/2005	QC-BF-DT-01	130.7	115.4	14.7	13.3	11.8	121.9	13.3	115.2	1.5	95%	PASS	Sand Cone QC-BF-SC-01 taken, index test sample BF-01 taken
6/14/2005	QC-BF-DT-02	128.1	111.8	14.6	-	13.3	116.0			1.3	96%	PASS	
6/15/2005	QC-BF-DT-03	137.6	122.3	12.5	-	11.8	121.9			0.7	100%	PASS	
6/15/2005	QC-BF-DT-04	136.2	120.3	13.2	-	11.8	121.9			1.4	99%	PASS	
6/15/2005	QC-BF-DT-05	132.8	117.9	12.6	-	11.8	121.9			0.8	97%	PASS	
6/15/2005	QC-BF-DT-06	136.7	121.7	12.3	-	11.8	121.9			0.5	100%	PASS	
6/16/2005	QC-BF-DT-07	134.4	119.3	12.7	-	11.8	121.9			0.9	98%	PASS	
6/16/2005	QC-BF-DT-08	133.4	117.7	13.3	-	12.1	119.3			1.2	99%	PASS	
6/16/2005	QC-BF-DT-09	131.2	114.7	14.4	-	13.3	116.0			1.1	99%	PASS	
6/16/2005	QC-BF-DT-10	127.9	115.6	10.6	-	11.8	121.9			-1.2	95%	PASS	
6/16/2005	QC-BF-DT-11	123.4	106.5	15.9	-	12.1	119.3			3.8	89%	FAIL	note 2; Area passed upon retesting
6/16/2005	QC-BF-DT-11A	130.2	115.9	12.3	-	12.1	119.3			0.2	97%	PASS	
6/16/2005	QC-BF-DT-11B	129.7	114.3	13.5	-	12.1	119.3			1.4	96%	PASS	
6/16/2005	QC-BF-DT-12	129.7	117.8	10.1	-	11.8	121.9			-1.7	97%	PASS	
6/16/2005	QC-BF-DT-13	132.8	118.8	11.8	-	11.8	121.9			0.0	97%	PASS	
6/16/2005	QC-BF-DT-14	132.5	117.0	13.2	-	11.8	121.9			1.4	96%	PASS	
6/16/2005	QC-BF-DT-15	122.4	107.8	13.5	-	11.8	121.9			1.7	88%	FAIL	note 2; Area passed upon retesting
6/16/2005	QC-BF-DT-15A	131.4	115.6	13.4		11.8	121.9			1.6	95%	PASS	
6/16/2005	QC-BF-DT-15B	131.1	117.0	12.0		11.8	121.9			0.2	96%	PASS	
6/16/2005	QC-BF-DT-16	133.1	117.4	13.4	-	11.8	121.9			1.6	96%	PASS	
6/17/2005	QC-BF-DT-17	135.7	120.9	15.1	12.2	11.9	121.5	12.2	123.9	0.3	100%	PASS	Sand Cone QC-BF-SC-02 taken, index test sample BF-02 taken
6/17/2005	QC-BF-DT-18	132.5	117.6	12.7	-	11.9	121.5			0.8	97%	PASS	
6/17/2005	QC-BF-DT-19	137.4	121.1	13.5	-	11.8	121.9			1.7	99%	PASS	
6/17/2005	QC-BF-DT-20	136.2	122.9	11.9	10.8	11.8	121.9			-1.0	101%	PASS	Oven M.C. sample taken
6/17/2005	QC-BF-DT-21	136.4	121.1	12.6	-	11.8	121.9			0.8	99%	PASS	
6/17/2005	QC-BF-DT-22	137.1	122.5	11.9	-	11.8	121.9			0.1	101%	PASS	
6/17/2005	QC-BF-DT-23	134.5	119.0	13.0	-	11.8	121.9			1.2	98%	PASS	
6/17/2005	QC-BF-DT-24	132.6	115.4	14.9	-	13.3	116.0			1.6	99%	PASS	
6/17/2005	QC-BF-DT-25	133.4	120.4	10.8	-	11.8	121.9			-1.0	99%	PASS	
6/17/2005	QC-BF-DT-26	137.3	122.0	12.5	-	11.8	121.9			0.7	100%	PASS	
6/17/2005	QC-BF-DT-27	136.1	122.0	13.0	11.6	11.2	123.4	11.6	128.5	0.4	99%	PASS	Sand Cone QC-BF-SC-03 taken, index test sample BF-03 taken
6/20/2005	QC-BF-DT-28	138.0	123.1	12.1	-	11.8	121.9			0.3	101%	PASS	
6/20/2005	QC-BF-DT-29	137.5	124.1	10.8	-	11.8	121.9			-1.0	102%	PASS	
6/20/2005	QC-BF-DT-30	134.6	123.0	9.4	-	11.8	121.9			-2.4	101%	FAIL	note 1; Area passed upon retesting
6/20/2005	QC-BF-DT-30A	136.9	123.0	11.3	-	11.8	121.9			-0.5	101%	PASS	
6/20/2005	QC-BF-DT-30B	137.7	121.5	13.3	-	11.8	121.9			1.5	100%	PASS	
6/20/2005	QC-BF-DT-31	134.8	121.7	10.8	-	11.8	121.9			-1.0	100%	PASS	
6/20/2005	QC-BF-DT-32	121.8	107.8	13.0	-	12.1	119.3			0.9	90%	FAIL	note 2; Area passed upon retesting
6/20/2005	QC-BF-DT-32A	126.9	112.8	12.5	-	12.1	119.3			0.4	95%	PASS	
6/20/2005	QC-BF-DT-32B	135.6	120.7	12.3	-	12.1	119.3			0.2	101%	PASS	
6/20/2005	QC-BF-DT-33	136.9	121.9	12.3	-	11.8	121.9			0.5	100%	PASS	
6/20/2005	QC-BF-DT-34	136.1	119.2	14.2	-	11.8	121.9			2.4	98%	FAIL	*See text in Section 6.3*
6/20/2005	QC-BF-DT-35	139.5	123.8	12.7	-	11.8	121.9			0.9	102%	PASS	
6/20/2005	QC-BF-DT-36	133.6	120.4	11.0	-	11.8	121.9			-0.8	99%	PASS	
6/20/2005	QC-BF-DT-37	126.0	115.2	9.4	-	11.8	121.9			-2.4	94%	FAIL	note 1 and 2; Area passed upon retesting
6/20/2005	QC-BF-DT-37A	125.1	115.2	8.6	-	11.8	121.9			-3.2	94%	FAIL	note 1 and 2; Area passed upon retesting
6/21/2005	QC-BF-DT-37AA	129.2	116.0	11.4	-	11.8	121.9			-0.4	95%	PASS	
6/20/2005	QC-BF-DT-37B	127.2	115.2	10.4	-	11.8	121.9			-1.4	95%	PASS	
6/20/2005	QC-BF-DT-38	135.2	119.4	13.2	-	11.8	121.9			1.4	98%	PASS	
6/21/2005	QC-BF-DT-39	134.4	117.6	14.3	-	13.3	116.0			1.0	101%	PASS	
6/21/2005	QC-BF-DT-40	136.0	121.4	12.2	12.0	10.5	126.9	10.1	128.4	1.5	96%	PASS	Sand Cone QC-BF-SC-04 taken, index test sample BF-04 taken
6/21/2005	QC-BF-DT-41	134.9	120.1	12.3	-	11.2	122.6			1.1	98%	PASS	
6/21/2005	QC-BF-DT-42	139.5	126.7	10.1	-	11.2	122.6			-1.1	103%	PASS	
6/21/2005	QC-BF-DT-43	134.3	117.7	14.1	-	13.3	116.0			0.8	101%	PASS	

Note 1: Material was re-conditioned prior to retesting
Note 2: Material was re-compacted proir to retesting
MC = Moisture Content (%)
DD = Dry Density (pcf)
F:\4886_002\QC Data\QC Density Tests.xls

Table 6.3
Summary of Field QC Compaction Tests

Date	Test #	Wet Density (pcf)	Dry Density (pcf)	Moisture Contents		Proctor Results		Sand Cone Results		-2 to 2	> 95%	Pass/Fail	Comments
				Field MC	Oven MC	Optimum MC	Maximum DD	MC	DD	% off MC	% Comp.		
6/21/2005	QC-BF-DT-44	135.2	123.8	9.2	-	11.2	122.6			-2.0	101%	PASS	
6/22/2005	QC-BF-DT-45	138.6	125.1	10.8	-	11.2	122.6			-0.4	102%	PASS	
6/22/2005	QC-BF-DT-46	141.0	127.5	10.6	-	11.2	122.6			-0.6	104%	PASS	
6/22/2005	QC-BF-DT-47	135.8	119.0	14.1	-	13.3	116.0			0.8	103%	PASS	
6/22/2005	QC-BF-DT-48	135.8	123.2	10.2	-	11.2	122.6			-1.0	101%	PASS	
6/22/2005	QC-BF-DT-49	137.0	124.3	10.2	-	11.2	122.6			-1.0	101%	PASS	
6/22/2005	QC-BF-DT-50	134.6	117.5	14.6	-	11.2	122.6			3.4	96%	FAIL	note 1; Area passed upon retesting
6/22/2005	QC-BF-DT-50A	132.3	121.2	9.1	-	11.2	122.6			-2.1	99%	FAIL	*note 1; Area passed upon retesting*
6/22/2005	QC-BF-DT-50B	127.3	116.0	9.8	-	11.2	122.6			-1.4	95%	PASS	
6/22/2005	QC-BF-DT-51	132.7	116.7	13.7	-	11.2	122.6			2.5	95%	FAIL	note 1; Area passed upon retesting
6/22/2005	QC-BF-DT-51A	132.6	121.3	9.3	-	11.2	122.6			-1.9	99%	PASS	
6/22/2005	QC-BF-DT-51B	134.0	119.7	11.9	-	11.2	122.6			0.7	98%	PASS	
6/22/2005	QC-BF-DT-52	133.4	119.2	14.7	11.9	10.2	125.5			1.7	95%	PASS	note 1; Area passed upon retesting, Index test sample BF-05 taken
6/23/2005	QC-BF-DT-53	134.8	119.9	12.4	-	11.2	122.6			1.2	98%	PASS	
6/23/2005	QC-BF-DT-54	136.5	121.7	12.2	-	11.2	122.6			1.0	99%	PASS	
6/23/2005	QC-BF-DT-55	131.8	118.6	11.1	-	11.2	122.6			-0.1	97%	PASS	
6/24/2005	QC-BF-DT-56	134.6	118.5	13.6	-	11.8	121.9			1.8	97%	PASS	
6/24/2005	QC-BF-DT-57	135.5	120.6	12.4	-	11.8	121.9			0.6	99%	PASS	
6/24/2005	QC-BF-DT-58	135.4	119.3	13.5	-	11.8	121.9			1.7	98%	PASS	
6/24/2005	QC-BF-DT-59	134.1	118.0	13.6	-	11.8	121.9			1.8	97%	PASS	
6/24/2005	QC-BF-DT-60	136.2	123.6	11.1	10.2	10.2	125.5	10.2	124.1	0.0	98%	PASS	Sand Cone QC-BF-SC-05 taken
6/27/2005	QC-BF-DT-61	130.7	116.3	12.4	-	11.2	122.6			1.2	95%	PASS	
6/27/2005	QC-BF-DT-62	135.1	124.1	8.9	-	10.0	125.9			-1.1	99%	PASS	
6/27/2005	QC-BF-DT-63	134.5	122.2	10.1	-	11.2	122.6			-1.1	100%	PASS	
6/27/2005	QC-BF-DT-64	134.7	119.0	13.2	-	11.2	122.6			2.0	97%	PASS	
6/27/2005	QC-BF-DT-65	135.9	119.6	13.6	-	13.3	116.0			0.3	103%	PASS	
6/27/2005	QC-BF-DT-66	135.8	121.9	11.4	-	11.8	121.9			-0.4	100%	PASS	
6/27/2005	QC-BF-DT-67	135.1	123.2	9.7	-	11.2	122.6			-1.5	100%	PASS	
6/27/2005	QC-BF-DT-68	131.2	118.6	10.6	-	11.2	122.6			-0.6	97%	PASS	
6/27/2005	QC-BF-DT-69	134.5	120.0	12.1	-	11.2	122.6			0.9	98%	PASS	
6/27/2005	QC-BF-DT-70	135.6	122.4	12.0	10.8	11.2	122.6			-0.4	100%	PASS	Oven M.C. sample taken
6/27/2005	QC-BF-DT-71	128.1	115.3	11.1	-	11.8	121.9			-0.7	95%	PASS	
6/27/2005	QC-BF-DT-72	121.8	111.9	6.9	-	11.2	122.6			-2.4	91%	FAIL	note 1 and 2; Area passed upon retesting
6/27/2005	QC-BF-DT-72A	133.7	121.0	8.8	-	11.2	122.6			-0.7	99%	PASS	
6/27/2005	QC-BF-DT-72B	134.2	120.8	10.5	-	11.2	122.6			-0.1	99%	PASS	
6/27/2005	QC-BF-DT-73	134.5	121.1	11.1	-	11.8	121.9			-0.7	99%	PASS	
6/27/2005	QC-BF-DT-74	136.3	122.2	11.5	-	11.8	121.9			-0.3	100%	PASS	
6/27/2005	QC-BF-DT-75	131.5	116.5	12.9	-	11.8	121.9			1.1	96%	PASS	
6/27/2005	QC-BF-DT-76	136.1	122.9	10.7	-	11.8	121.9			-1.1	101%	PASS	
6/27/2005	QC-BF-DT-77	137.4	124.1	10.7	-	11.8	121.9			-1.1	102%	PASS	
6/27/2005	QC-BF-DT-78	135.4	121.9	11.1	-	11.8	121.9			-0.7	100%	PASS	
6/27/2005	QC-BF-DT-79	126.0	113.0	11.5	-	11.8	121.9			-0.3	93%	FAIL	Index test sample BF-06 taken; See text in Section 6.3
6/27/2005	QC-BF-DT-80	134.0	119.2	12.4	-	11.8	121.9			0.6	98%	PASS	
6/27/2005	QC-BF-DT-81	136.1	121.2	12.3	-	11.8	121.9			0.5	99%	PASS	
6/27/2005	QC-BF-DT-82	130.6	121.9	7.2	-	11.2	122.6			-4.0	99%	FAIL	note 1; Area passed upon retesting
6/27/2005	QC-BF-DT-82A	128.2	115.8	10.7	-	11.2	122.6			-0.5	94%	FAIL	note 2; Area passed upon retesting
6/27/2005	QC-BF-DT-82B	130.5	119.0	9.7	-	11.2	122.6			-1.5	97%	PASS	
6/28/2005	QC-BF-DT-82AA	135.3	120.2	12.6	-	11.2	122.6			1.4	98%	PASS	
6/28/2005	QC-BF-DT-82BB	131.8	117.5	12.2	-	11.2	122.6			1.0	96%	PASS	
6/27/2005	QC-BF-DT-83	133.4	123.3	8.2	-	11.2	122.6			-3.0	101%	FAIL	note 1; Area passed upon retesting
6/28/2005	QC-BF-DT-83A	133.3	121.0	10.2	-	11.2	122.6			-1.0	99%	PASS	
6/28/2005	QC-BF-DT-83B	130.1	118.4	9.9	-	11.2	122.6			-1.3	97%	PASS	
6/27/2005	QC-BF-DT-84	131.2	116.4	12.7	-	11.2	122.6			1.5	95%	PASS	
6/27/2005	QC-BF-DT-85	135.5	121.6	11.4	-	11.2	122.6			0.2	99%	PASS	
6/27/2005	QC-BF-DT-86	135.1	124.7	8.3	-	11.2	122.6			-2.9	102%	FAIL	note 1; Area passed upon retesting
6/28/2005	QC-BF-DT-86A	133.2	121.0	10.1	-	11.2	122.6			-1.1	99%	PASS	
6/28/2005	QC-BF-DT-86B	138.2	125.5	10.1	-	11.2	122.6			-1.1	102%	PASS	

Note 1: Material was re-conditioned prior to retesting
Note 2: Material was re-compacted proir to retesting
MC = Moisture Content (%)
DD = Dry Density (pcf)
F:\4886_002\QC Data\QC Density Tests.xls

Table 6.3
Summary of Field QC Compaction Tests

Date	Test #	Wet Density (pcf)	Dry Density (pcf)	Moisture Contents		Proctor Results		Sand Cone Results		-2 to 2	> 95%	Pass/Fail	Comments
				Field MC	Oven MC	Optimum MC	Maximum DD	MC	DD	% off MC	% Comp.		
6/27/2005	QC-BF-DT-87	130.2	115.3	12.9	-	11.2	122.6			1.7	94%	FAIL	note 2; Area passed upon retesting
6/28/2005	QC-BF-DT-87A	137.7	124.2	10.9	-	11.2	122.6			-0.3	101%	PASS	
6/28/2005	QC-BF-DT-87B	135.1	119.8	12.8	-	11.2	122.6			1.6	98%	PASS	
6/27/2005	QC-BF-DT-88	130.3	116.1	12.2	-	11.2	122.6			1.0	95%	PASS	
6/27/2005	QC-BF-DT-89	128.9	115.7	11.4	-	11.2	122.6			0.2	94%	FAIL	note 2; Area passed upon retesting
6/28/2005	QC-BF-DT-89A	136.8	121.0	13.1	-	11.2	122.6			1.9	99%	PASS	
6/28/2005	QC-BF-DT-89B	136.5	120.8	13.0	-	11.2	122.6			1.8	99%	PASS	
6/28/2005	QC-BF-DT-90	136.7	121.8	12.2	-	11.8	121.9			0.4	100%	PASS	
6/28/2005	QC-BF-DT-91	133.6	119.5	11.8	-	11.8	121.9			0.0	98%	PASS	
6/28/2005	QC-BF-DT-92	130.5	114.8	13.7	-	12.1	119.3			1.6	96%	PASS	
6/28/2005	QC-BF-DT-93	136.6	122.7	11.3	-	11.8	121.9			-0.5	101%	PASS	
6/28/2005	QC-BF-DT-94	137.1	123.6	13.4	10.9	11.6	121.9	10.9	125.2	-0.7	101%	PASS	Sand Cone QC-BF-SC-06 taken, index test sample BF-07 taken
6/28/2005	QC-BF-DT-95	137.2	120.8	13.6	-	11.8	121.9			1.8	99%	PASS	
6/28/2005	QC-BF-DT-96	137.1	121.1	13.2	-	11.8	121.9			1.4	99%	PASS	
6/28/2005	QC-BF-DT-97	134.8	118.5	13.8	-	11.8	121.9			2.0	97%	PASS	
6/28/2005	QC-BF-DT-98	134.9	120.6	11.9	-	11.8	121.9			0.1	99%	PASS	
6/28/2005	QC-BF-DT-99	135.8	122.3	11.0	-	11.8	121.9			-0.8	100%	PASS	
6/28/2005	QC-BF-DT-100	132.1	119.0	11.0	-	11.8	121.9			-0.8	98%	PASS	
6/28/2005	QC-BF-DT-101	134.0	117.6	13.9	-	12.1	119.3			1.8	99%	PASS	
6/28/2005	QC-BF-DT-102	137.9	122.9	12.2	-	11.8	121.9			0.4	101%	PASS	
6/28/2005	QC-BF-DT-103	137.5	124.7	10.3	-	11.8	121.9			-1.5	102%	PASS	
6/28/2005	QC-BF-DT-104	134.2	121.0	10.9	-	11.8	121.9			-0.9	99%	PASS	
6/28/2005	QC-BF-DT-105	136.0	121.3	12.1	-	11.8	121.9			0.3	100%	PASS	
6/28/2005	QC-BF-DT-106	135.8	119.2	14.0	-	12.1	119.3			1.9	100%	PASS	
6/28/2005	QC-BF-DT-107	135.9	121.4	12.0	-	11.8	121.9			0.2	100%	PASS	
6/28/2005	QC-BF-DT-108	126.3	113.1	11.8	-	12.1	119.3			-0.3	95%	PASS	
6/28/2005	QC-BF-DT-109	131.3	116.5	12.7	-	11.8	121.9			0.9	96%	PASS	
6/28/2005	QC-BF-DT-110	134.2	119.2	12.6	-	11.8	121.9			0.8	98%	PASS	
6/28/2005	QC-BF-DT-111	133.7	119.4	12.0	-	11.8	121.9			0.2	98%	PASS	
6/28/2005	QC-BF-DT-112	131.8	117.1	12.6	-	11.8	121.9			0.8	96%	PASS	
6/28/2005	QC-BF-DT-113	136.9	123.4	10.9	-	11.8	121.9			-0.9	101%	PASS	
6/28/2005	QC-BF-DT-114	132.8	118.5	12.1	-	11.8	121.9			0.3	97%	PASS	
6/29/2005	QC-BF-DT-115	137.0	121.9	12.4	-	11.8	121.9			0.6	100%	PASS	
6/29/2005	QC-BF-DT-116	136.4	122.7	11.2	-	11.8	121.9			-0.6	101%	PASS	
6/29/2005	QC-BF-DT-117	135.0	116.7	15.7	-	11.8	121.9			3.9	96%	FAIL	note 1; Area passed upon retesting
6/29/2005	QC-BF-DT-117A	137.9	123.6	11.6	-	11.8	121.9			-0.2	101%	PASS	
6/29/2005	QC-BF-DT-117B	136.7	121.2	12.8	-	11.8	121.9			1.0	99%	PASS	
6/29/2005	QC-BF-DT-118	136.4	120.6	13.1	-	11.8	121.9			1.3	99%	PASS	
6/29/2005	QC-BF-DT-119	133.3	117.7	13.3	-	11.8	121.9			1.5	97%	PASS	
6/29/2005	QC-BF-DT-120	135.2	118.9	13.7	-	11.8	121.9			1.9	98%	PASS	
6/29/2005	QC-BF-DT-121	136.6	120.4	13.5	-	11.8	121.9			1.7	99%	PASS	
6/29/2005	QC-BF-DT-122	132.2	117.4	12.6	-	11.8	121.9			0.8	96%	PASS	
6/29/2005	QC-BF-DT-123	138.1	122.6	12.6	-	11.8	121.9			0.8	101%	PASS	
6/29/2005	QC-BF-DT-124	135.8	120.7	12.5	-	11.8	121.9			0.7	99%	PASS	
6/29/2005	QC-BF-DT-125	134.8	119.4	12.9	-	11.8	121.9			1.1	98%	PASS	
6/29/2005	QC-BF-DT-126	135.2	118.6	14.0	-	11.8	121.9			2.2	97%	FAIL	note 1; Area passed upon retesting
6/29/2005	QC-BF-DT-126A	136.3	121.3	12.4	-	11.8	121.9			0.6	99%	PASS	
6/29/2005	QC-BF-DT-126B	135.8	120.4	12.8	-	11.8	121.9			1.0	99%	PASS	
6/29/2005	QC-BF-DT-127	132.9	118.2	12.4	-	11.8	121.9			0.6	97%	PASS	
6/29/2005	QC-BF-DT-128	130.2	113.1	15.1	-	11.8	121.9			3.3	93%	FAIL	note 1 and 2; Area passed upon retesting
6/29/2005	QC-BF-DT-128A	134.6	119.0	13.1	-	11.8	121.9			1.3	98%	PASS	
6/29/2005	QC-BF-DT-128B	134.2	119.1	12.7	-	11.8	121.9			0.9	98%	PASS	
6/29/2005	QC-BF-DT-129	134.0	118.6	13.0	-	11.8	121.9			1.2	97%	PASS	
6/29/2005	QC-BF-DT-130	134.3	117.5	14.3	-	11.8	121.9			2.5	96%	FAIL	note 1 and 2; Area passed upon retesting
6/29/2005	QC-BF-DT-130A	135.6	119.7	13.3	-	11.8	121.9			1.5	98%	PASS	
6/29/2005	QC-BF-DT-130B	135.7	121.7	11.5	-	11.8	121.9			-0.3	100%	PASS	

Note 1: Material was re-conditioned prior to retesting
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MC = Moisture Content (%)
DD = Dry Density (pcf)
F:\4886_002\QC Data\QC Density Tests.xls

Table 6.3
Summary of Field QC Compaction Tests

Date	Test #	Wet Density (pcf)	Dry Density (pcf)	Moisture Contents		Proctor Results		Sand Cone Results		-2 to 2	> 95%	Pass/Fail	Comments
				Field MC	Oven MC	Optimum MC	Maximum DD	MC	DD	% off MC	% Comp.		
6/29/2005	QC-BF-DT-131	134.2	121.7	13.7	10.3	11.0	123.5			-0.7	99%	PASS	Index test sample BF-08 taken
6/29/2005	QC-BF-DT-132	132.7	118.2	12.3	-	11.8	121.9			0.5	97%	PASS	
6/29/2005	QC-BF-DT-133	136.9	122.0	12.2	-	11.8	121.9			0.4	100%	PASS	
6/29/2005	QC-BF-DT-134	136.6	121.6	12.3	-	11.8	121.9			0.5	100%	PASS	
6/29/2005	QC-BF-DT-135	135.0	119.0	13.4	-	11.8	121.9			1.6	98%	PASS	
6/29/2005	QC-BF-DT-136	135.9	123.1	12.5	10.4	11.8	121.9			-1.4	101%	PASS	Oven M.C. sample taken
6/29/2005	QC-BF-DT-137	134.3	119.7	12.1	-	11.8	121.9			0.3	98%	PASS	
6/29/2005	QC-BF-DT-138	131.1	115.8	13.2	-	11.8	121.9			1.4	95%	PASS	
6/29/2005	QC-BF-DT-139	128.9	115.6	11.6	-	11.8	121.9			-0.2	95%	PASS	
6/29/2005	QC-BF-DT-140	127.1	113.5	12.0	-	11.8	121.9			0.2	93%	FAIL	note 2; Area passed upon retesting
6/29/2005	QC-BF-DT-140A	131.0	114.8	14.1	-	11.8	121.9			2.3	94%	FAIL	note 1 and 2; Area passed upon retesting
6/29/2005	QC-BF-DT-140B	134.6	120.1	12.0	-	11.8	121.9			0.2	99%	PASS	
6/29/2005	QC-BF-DT-140C	133.7	119.8	11.6	-	11.8	121.9			-0.2	98%	PASS	
6/29/2005	QC-BF-DT-141	133.1	119.7	11.2	-	11.8	121.9			-0.6	98%	PASS	
6/29/2005	QC-BF-DT-142	129.9	119.4	8.8	-	11.8	121.9			-3.0	98%	FAIL	note 1; Area passed upon retesting
6/29/2005	QC-BF-DT-142A	129.7	116.4	11.4	-	11.8	121.9			-0.4	96%	PASS	
6/29/2005	QC-BF-DT-142B	130.9	116.3	12.6	-	11.8	121.9			0.8	95%	PASS	
6/29/2005	QC-BF-DT-143	131.2	119.6	9.7	-	11.8	121.9			-2.1	98%	FAIL	note 1; Area passed upon retesting
6/29/2005	QC-BF-DT-143A	139.9	114.6	14.2	-	11.8	121.9			2.4	94%	FAIL	note 1 and 2; Area passed upon retesting
6/29/2005	QC-BF-DT-143B	131.9	118.5	11.4	-	11.8	121.9			-0.4	97%	PASS	
6/29/2005	QC-BF-DT-143C	132.3	116.9	13.2	-	11.8	121.9			1.4	96%	PASS	
6/29/2005	QC-BF-DT-144	133.1	119.8	11.1	-	11.8	121.9			-0.7	98%	PASS	
6/29/2005	QC-BF-DT-145	129.9	116.9	11.1	-	11.8	121.9			-0.7	96%	PASS	
6/29/2005	QC-BF-DT-146	134.3	119.1	12.8	-	11.8	121.9			1.0	98%	PASS	
6/29/2005	QC-BF-DT-147	134.0	119.7	11.9	-	11.8	121.9			0.1	98%	PASS	
6/29/2005	QC-BF-DT-148	134.1	119.2	12.5	-	11.8	121.9			0.7	98%	PASS	
6/29/2005	QC-BF-DT-149	133.5	119.5	11.8	-	11.8	121.9			0.0	98%	PASS	
6/29/2005	QC-BF-DT-150	134.8	119.4	12.9	-	11.9	121.5			1.0	98%	PASS	
6/29/2005	QC-BF-DT-151	133.6	118.7	12.5	-	11.8	121.9			0.7	97%	PASS	
6/29/2005	QC-BF-DT-152	133.7	118.7	12.7	-	11.9	121.5			0.8	98%	PASS	
6/29/2005	QC-BF-DT-153	137.0	122.0	12.2	-	11.9	121.5			0.3	100%	PASS	
6/30/2005	QC-BF-DT-154	135.3	120.1	12.7	-	11.9	121.5			0.8	99%	PASS	
6/30/2005	QC-BF-DT-155	134.6	121.9	12.8	10.4	11.9	121.5			-1.5	100%	PASS	Oven M.C. sample taken
6/30/2005	QC-BF-DT-156	136.2	121.9	11.7	-	11.9	121.5			-0.2	100%	PASS	
6/30/2005	QC-BF-DT-157	134.7	119.4	12.8	-	11.9	121.5			0.9	98%	PASS	
6/30/2005	QC-BF-DT-158	135.7	122.3	11.0	-	11.9	121.5			-0.9	101%	PASS	
6/30/2005	QC-BF-DT-159	135.2	118.8	13.8	-	11.9	121.5			1.9	98%	PASS	
6/30/2005	QC-BF-DT-160	133.5	117.6	13.5	-	11.9	121.5			1.6	97%	PASS	
6/30/2005	QC-BF-DT-161	135.3	119.7	13.0	-	11.9	121.5			1.1	99%	PASS	
6/30/2005	QC-BF-DT-162	135.3	119.1	13.6	-	11.9	121.5			1.7	98%	PASS	
6/30/2005	QC-BF-DT-163	133.3	118.3	12.7	-	11.9	121.5			0.8	97%	PASS	
6/30/2005	QC-BF-DT-164	137.1	121.0	13.3	-	11.9	121.5			1.4	100%	PASS	
6/30/2005	QC-BF-DT-165	138.7	125.6	11.6	10.4	10.5	126.9	10.4	128.2	-0.1	99%	PASS	Sand Cone QC-BF-SC-07 taken
6/30/2005	QC-BF-DT-166	132.0	118.8	11.1	-	11.9	121.5			-0.8	98%	PASS	
6/30/2005	QC-BF-DT-167	125.9	114.8	9.7	-	11.9	121.5			-2.2	94%	FAIL	note 1 and 2; Area passed upon retesting
6/30/2005	QC-BF-DT-167A	126.1	113.4	11.2	-	11.9	121.5			-0.7	93%	FAIL	note 2; Area passed upon retesting
6/30/2005	QC-BF-DT-167B	135.4	119.2	13.6	-	11.9	121.5			1.7	98%	PASS	
6/30/2005	QC-BF-DT-167C	136.0	122.2	11.3	-	11.9	121.5			-0.6	101%	PASS	
6/30/2005	QC-BF-DT-168	134.0	122.4	9.5	-	11.9	121.5			-2.4	101%	FAIL	note 1; Area passed upon retesting
6/30/2005	QC-BF-DT-168A	134.8	120.1	12.2	-	11.9	121.5			0.3	99%	PASS	
6/30/2005	QC-BF-DT-168B	135.0	119.2	13.3	-	11.9	121.5			1.4	98%	PASS	
6/30/2005	QC-BF-DT-169	124.3	114.6	8.5	-	11.9	121.5			-3.4	94%	FAIL	note 1 and 2; Area passed upon retesting
6/30/2005	QC-BF-DT-169A	130.7	117.9	10.9	-	11.9	121.5			-1.0	97%	PASS	
6/30/2005	QC-BF-DT-169B	135.4	121.1	11.8	-	11.9	121.5			-0.1	100%	PASS	
6/30/2005	QC-BF-DT-170	129.8	118.0	10.0	-	11.9	121.5			-1.9	97%	PASS	
6/30/2005	QC-BF-DT-171	131.2	117.2	11.9	-	11.9	121.5			0.0	97%	PASS	
6/30/2005	QC-BF-DT-172	135.9	122.1	11.3	-	11.9	121.5			-0.6	100%	PASS	

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MC = Moisture Content (%)
DD = Dry Density (pcf)
F:\4886_002\QC Data\QC Density Tests.xls

Table 6.3
Summary of Field QC Compaction Tests

Date	Test #	Wet Density (pcf)	Dry Density (pcf)	Moisture Contents		Proctor Results		Sand Cone Results		-2 to 2	> 95%	Pass/Fail	Comments
				Field MC	Oven MC	Optimum MC	Maximum DD	MC	DD	% off MC	% Comp.		
6/30/2005	QC-BF-DT-173	134.9	121.0	11.5	-	11.9	121.5			-0.4	100%	PASS	
6/30/2005	QC-BF-DT-174	136.2	122.0	11.6	-	11.9	121.5			-0.3	100%	PASS	
6/30/2005	QC-BF-DT-175	135.1	120.0	12.6	-	11.9	121.5			0.7	99%	PASS	
6/30/2005	QC-BF-DT-176	135.5	121.2	11.8	-	11.9	121.5			-0.1	100%	PASS	
6/30/2005	QC-BF-DT-177	133.8	119.7	11.8	-	11.9	121.5			-0.1	99%	PASS	
6/30/2005	QC-BF-DT-178	133.9	119.4	12.1	-	11.9	121.5			0.2	98%	PASS	
7/1/2005	QC-BF-DT-179	135.9	121.9	12.3	11.5	10.5	126.9	11.5	122.4	1.0	96%	PASS	Sand Cone QC-BF-SC-08 taken
7/1/2005	QC-BF-DT-180	136.1	121.7	11.8	-	10.5	126.9			1.3	96%	PASS	
7/1/2005	QC-BF-DT-181	133.7	118.7	12.6	-	11.9	121.5			0.7	98%	PASS	
7/1/2005	QC-BF-DT-182	136.6	121.9	12.1	-	10.5	126.9			1.6	96%	PASS	
7/1/2005	QC-BF-DT-183	134.3	117.8	14.0	-	11.9	121.5			2.1	97%	FAIL	note 1; Area passed upon retesting
7/1/2005	QC-BF-DT-183A	135.4	119.4	13.4	-	11.9	121.5			1.5	98%	PASS	
7/1/2005	QC-BF-DT-183B	134.0	118.5	13.1	-	11.9	121.5			1.2	98%	PASS	
7/1/2005	QC-BF-DT-184	135.2	121.7	11.1	-	11.9	121.5			-0.8	100%	PASS	
7/1/2005	QC-BF-DT-185	132.8	118.3	13.9	12.3	11.9	121.5			0.4	97%	PASS	Oven M.C. sample taken
7/1/2005	QC-BF-DT-186	136.3	122.0	11.7	-	10.5	126.9			1.2	96%	PASS	
7/1/2005	QC-BF-DT-187	139.2	124.0	12.3	-	10.5	126.9			1.8	98%	PASS	
7/1/2005	QC-BF-DT-188	137.0	124.0	10.5	-	10.5	126.9			0.0	98%	PASS	
7/1/2005	QC-BF-DT-189	135.0	121.6	11.0	-	10.5	126.9			0.5	96%	PASS	
7/1/2005	QC-BF-DT-190	133.0	121.2	10.4	-	10.5	126.9			-0.1	96%	PASS	
7/1/2005	QC-BF-DT-191	134.9	121.3	11.2	-	10.5	126.9			0.7	96%	PASS	
7/1/2005	QC-BF-DT-192	135.3	121.7	11.2	-	10.5	126.9			0.7	96%	PASS	
7/1/2005	QC-BF-DT-193	133.3	121.2	10.0	-	10.5	126.9			-0.5	95%	PASS	
7/1/2005	QC-BF-DT-194	134.8	121.0	11.4	-	10.5	126.9			0.9	95%	PASS	
7/1/2005	QC-BF-DT-195	135.8	124.5	9.1	-	11.9	121.5			-2.8	102%	FAIL	note 1; Area passed upon retesting
7/1/2005	QC-BF-DT-195A	136.8	123.1	11.1	-	11.9	121.5			-0.8	101%	PASS	
7/1/2005	QC-BF-DT-195B	137.8	123.4	11.7	-	11.9	121.5			-0.2	102%	PASS	
7/5/2005	QC-BF-DT-196	133.4	122.6	10.3	8.8	10.2	125.5	8.8	128.5	-1.4	98%	PASS	Sand Cone QC-BF-SC-09 taken
7/5/2005	QC-BF-DT-197	135.3	121.6	11.3	-	10.2	125.5			1.1	97%	PASS	
7/5/2005	QC-BF-DT-198	132.6	119.4	11.1	-	11.9	121.5			-0.8	98%	PASS	
7/5/2005	QC-BF-DT-199	136.6	122.3	11.7	-	11.9	121.5			-0.2	101%	PASS	
7/5/2005	QC-BF-DT-200	136.5	122.2	11.7	-	10.2	125.5			1.5	97%	PASS	
7/5/2005	QC-BF-DT-201	136.5	121.2	12.6	-	11.9	121.5			0.7	100%	PASS	
7/5/2005	QC-BF-DT-202	135.7	122.0	11.2	-	10.2	125.5			1.0	97%	PASS	
7/5/2005	QC-BF-DT-203	129.9	115.9	12.1	-	11.9	121.5			0.2	95%	PASS	
7/5/2005	QC-BF-DT-204	136.0	121.8	11.6	-	10.2	125.5			1.4	97%	PASS	
7/5/2005	QC-BF-DT-205	138.2	126.5	9.2	-	11.9	121.5			-2.7	104%	FAIL	note 1; Area passed upon retesting
7/5/2005	QC-BF-DT-205A	138.0	126.6	9.0	-	11.9	121.5			-2.9	104%	FAIL	note 1; Area passed upon retesting
7/5/2005	QC-BF-DT-205B	135.6	124.6	8.8	-	11.9	121.5			-3.1	103%	FAIL	note 1; Area passed upon retesting
7/5/2005	QC-BF-DT-205C	133.6	120.5	10.9	-	11.9	121.5			-1.0	99%	PASS	
7/5/2005	QC-BF-DT-205D	137.4	124.8	10.1	-	11.9	121.5			-1.8	103%	PASS	
7/5/2005	QC-BF-DT-205E	133.2	119.9	11.1	-	11.9	121.5			-0.8	99%	PASS	
7/5/2005	QC-BF-DT-206	139.2	124.3	11.9	-	10.5	126.9			1.4	98%	PASS	
7/5/2005	QC-BF-DT-207	136.5	123.0	11.0	-	10.5	126.9			0.5	97%	PASS	
7/5/2005	QC-BF-DT-208	136.5	123.0	11.0	-	10.5	126.9			0.5	97%	PASS	
7/5/2005	QC-BF-DT-209	132.9	119.9	10.8	-	10.5	126.9			0.3	95%	PASS	
7/6/2005	QC-BF-DT-210	137.6	121.1	13.6	-	10.9	122.7			2.7	99%	FAIL	note 1; Area passed upon retesting
7/6/2005	QC-BF-DT-210A	134.6	119.4	12.7	-	10.9	122.7			1.8	97%	PASS	
7/6/2005	QC-BF-DT-210B	135.2	120.2	12.5	-	10.9	122.7			1.6	98%	PASS	
7/6/2005	QC-BF-DT-211	129.1	112.9	14.3	-	10.9	122.7			3.4	92%	FAIL	note 1 and 2; Area passed upon retesting
7/6/2005	QC-BF-DT-211A	135.2	119.3	13.3	-	10.9	122.7			2.4	97%	FAIL	note 1; Area passed upon retesting
7/6/2005	QC-BF-DT-211B	135.9	120.9	12.4	-	10.9	122.7			1.5	99%	PASS	
7/6/2005	QC-BF-DT-211C	135.0	119.6	12.9	-	10.9	122.7			2.0	97%	PASS	
7/6/2005	QC-BF-DT-212	133.9	119.6	12.0	-	10.9	122.7			1.1	97%	PASS	
7/6/2005	QC-BF-DT-213	134.6	121.3	12.4	11.0	10.2	125.5	11.0	126.7	0.8	97%	PASS	Sand Cone QC-BF-SC-10 taken
7/6/2005	QC-BF-DT-214	131.2	118.4	10.8	-	10.9	122.7			-0.1	97%	PASS	
7/6/2005	QC-BF-DT-215	131.5	119.4	10.1	-	10.2	125.5			-0.1	95%	PASS	

Note 1: Material was re-conditioned prior to retesting
Note 2: Material was re-compacted proir to retesting
MC = Moisture Content (%)
DD = Dry Density (pcf)
F:\4886_002\QC Data\QC Density Tests.xls

Table 6.3
Summary of Field QC Compaction Tests

Date	Test #	Wet Density (pcf)	Dry Density (pcf)	Moisture Contents		Proctor Results		Sand Cone Results		-2 to 2	> 95%	Pass/Fail	Comments
				Field MC	Oven MC	Optimum MC	Maximum DD	MC	DD	% off MC	% Comp.		
7/6/2005	QC-BF-DT-216	133.5	122.3	9.2	-	10.2	125.5			-1.0	97%	PASS	
7/6/2005	QC-BF-DT-217	134.3	119.8	12.1	-	10.9	122.7			1.2	98%	PASS	
7/6/2005	QC-BF-DT-218	136.4	123.0	10.9	-	10.5	126.9			0.4	97%	PASS	
7/6/2005	QC-BF-DT-219	135.6	120.0	13.0	-	10.9	122.7			2.1	98%	FAIL	note 1; Area passed upon retesting
7/6/2005	QC-BF-DT-219A	138.0	123.4	11.8	-	10.9	122.7			0.9	101%	PASS	
7/6/2005	QC-BF-DT-219B	137.4	123.6	11.2	-	10.9	122.7			0.3	101%	PASS	
7/6/2005	QC-BF-DT-220	133.8	121.5	10.1	-	10.5	126.9			-0.4	96%	PASS	
7/6/2005	QC-BF-DT-221	135.8	121.8	11.5	-	10.5	126.9			1.0	96%	PASS	
7/7/2005	QC-BF-DT-222	136.7	122.7	11.4	-	10.5	126.9			0.9	97%	PASS	
7/7/2005	QC-BF-DT-223	134.2	120.0	11.8	-	10.5	126.9			1.3	95%	PASS	
7/7/2005	QC-BF-DT-224	134.0	120.4	11.3	-	10.5	126.9			0.8	95%	PASS	
7/7/2005	QC-BF-DT-225	138.5	122.8	12.8	-	10.5	126.9			2.3	97%	FAIL	See text in Section 6.3
7/7/2005	QC-BF-DT-226	135.6	121.0	12.1	-	10.5	126.9			1.6	95%	PASS	
7/7/2005	QC-BF-DT-227	131.0	115.3	13.6	-	10.5	126.9			3.1	91%	FAIL	note 1 and 2; Area passed upon retesting
7/7/2005	QC-BF-DT-227A	135.6	119.5	13.5	-	10.5	126.9			3.0	94%	FAIL	note 1 and 2; Area passed upon retesting
7/7/2005	QC-BF-DT-227B	135.0	121.0	11.6	-	10.5	126.9			1.1	95%	PASS	
7/7/2005	QC-BF-DT-227C	138.5	123.7	12.0	-	10.5	126.9			1.5	97%	PASS	
7/7/2005	QC-BF-DT-228	134.6	121.6	12.8	10.7	10.5	126.9	10.7	127.8	0.2	96%	PASS	Sand Cone QC-BF-SC-11 taken
7/7/2005	QC-BF-DT-229	136.3	121.3	12.4	-	11.1	122.9			1.3	99%	PASS	
7/7/2005	QC-BF-DT-230	130.9	114.9	13.9	-	11.1	122.9			2.8	94%	FAIL	note 1 and 2; Area passed upon retesting
7/8/2005	QC-BF-DT-230A	137.2	120.2	14.1	-	11.1	122.9			3.0	98%	PASS	
7/8/2005	QC-BF-DT-230B	130.3	117.4	11.0	-	11.1	122.9			-0.1	96%	PASS	
7/8/2005	QC-BF-DT-230C	137.2	121.4	10.0	-	11.1	122.9			-1.1	99%	PASS	
7/8/2005	QC-BF-DT-230D	130.3	123.1	9.9	-	11.1	122.9			-1.2	100%	PASS	
7/7/2005	QC-BF-DT-231	134.2	121.6	10.4	-	11.1	122.9			-0.7	99%	PASS	
7/7/2005	QC-BF-DT-232	135.1	122.0	10.7	-	11.1	122.9			-0.4	99%	PASS	
7/7/2005	QC-BF-DT-233	137.1	124.0	10.6	-	11.1	122.9			-0.5	101%	PASS	
7/7/2005	QC-BF-DT-234	130.1	118.5	9.8	-	11.1	122.9			-1.3	96%	PASS	
7/7/2005	QC-BF-DT-235	133.1	120.9	10.1	-	11.1	122.9			-1.0	98%	PASS	
7/7/2005	QC-BF-DT-236	130.1	117.1	11.1	-	11.9	121.5			-0.8	96%	PASS	
7/7/2005	QC-BF-DT-237	133.1	120.9	10.1	-	10.5	126.9			-0.4	95%	PASS	
7/8/2005	QC-BF-DT-238	138.7	122.9	12.9	-	11.9	121.5			1.0	101%	PASS	
7/8/2005	QC-BF-DT-239	135.2	120.5	12.2	-	10.5	126.9			1.7	95%	PASS	
7/8/2005	QC-BF-DT-240	135.3	122.0	12.7	10.9	10.5	126.9	10.9	133.2	0.4	96%	PASS	Sand Cone QC-BF-SC-12 taken
7/8/2005	QC-BF-DT-241	134.9	121.9	10.7	-	10.5	126.9			0.2	96%	PASS	
7/8/2005	QC-BF-DT-242	135.8	120.9	12.3	-	10.5	126.9			1.8	95%	PASS	
7/8/2005	QC-BF-DT-243	136.4	120.2	13.5	-	11.9	121.5			1.6	99%	PASS	
7/8/2005	QC-BF-DT-244	136.4	120.8	12.9	-	11.9	121.5			1.0	99%	PASS	
7/8/2005	QC-BF-DT-245	135.0	119.3	12.9	-	11.9	121.5			1.0	98%	PASS	
7/8/2005	QC-BF-DT-246	135.3	121.3	11.5	-	11.9	121.5			-0.4	100%	PASS	
7/8/2005	QC-BF-DT-247	136.3	120.6	13.0	-	11.9	121.5			1.1	99%	PASS	
7/8/2005	QC-BF-DT-248	133.4	121.1	10.2	-	10.5	126.9			-0.3	95%	PASS	
7/8/2005	QC-BF-DT-249	132.4	116.2	13.9	-	11.1	122.9			2.8	95%	FAIL	note 1; Area passed upon retesting
7/8/2005	QC-BF-DT-249A	133.5	117.8	13.3	-	11.1	122.9			2.2	96%	FAIL	note 1; Area passed upon retesting
7/8/2005	QC-BF-DT-249B	133.1	118.0	12.8	-	11.1	122.9			1.7	96%	PASS	
7/8/2005	QC-BF-DT-249C	135.2	119.3	13.3	-	11.1	122.9			2.2	97%	FAIL	note 1; Area passed upon retesting
7/11/2005	QC-BF-DT-249D	134.9	120.6	11.9	-	11.1	122.9			0.8	98%	PASS	
7/8/2005	QC-BF-DT-250	130.0	115.6	12.5	-	11.6	121.3			0.9	95%	PASS	
7/8/2005	QC-BF-DT-251	135.6	121.3	11.8	-	10.5	126.9			1.3	96%	PASS	
7/8/2005	QC-BF-DT-252	141.0	125.2	12.6	-	11.2	123.4			1.4	101%	PASS	
7/11/2005	QC-BF-DT-253	138.0	123.3	11.9	-	10.5	126.9			1.4	97%	PASS	
7/11/2005	QC-BF-DT-254	137.0	121.7	12.6	-	11.2	123.4			1.4	99%	PASS	
7/11/2005	QC-BF-DT-255	136.1	121.8	11.7	-	11.6	121.3			0.1	100%	PASS	
7/11/2005	QC-BF-DT-256	132.1	117.8	12.1	-	11.6	121.3			0.5	97%	PASS	
7/11/2005	QC-BF-DT-257	128.6	114.2	12.6	-	12.1	119.3			0.5	96%	PASS	
7/11/2005	QC-BF-DT-258	135.0	122.4	12.0	10.3	10.3	125.9			0.0	97%	PASS	Index test sample BF-09 taken
7/11/2005	QC-BF-DT-259	136.3	122.9	10.9	-	10.5	126.9			0.4	97%	PASS	

Note 1: Material was re-conditioned prior to retesting
Note 2: Material was re-compacted proir to retesting
MC = Moisture Content (%)
DD = Dry Density (pcf)

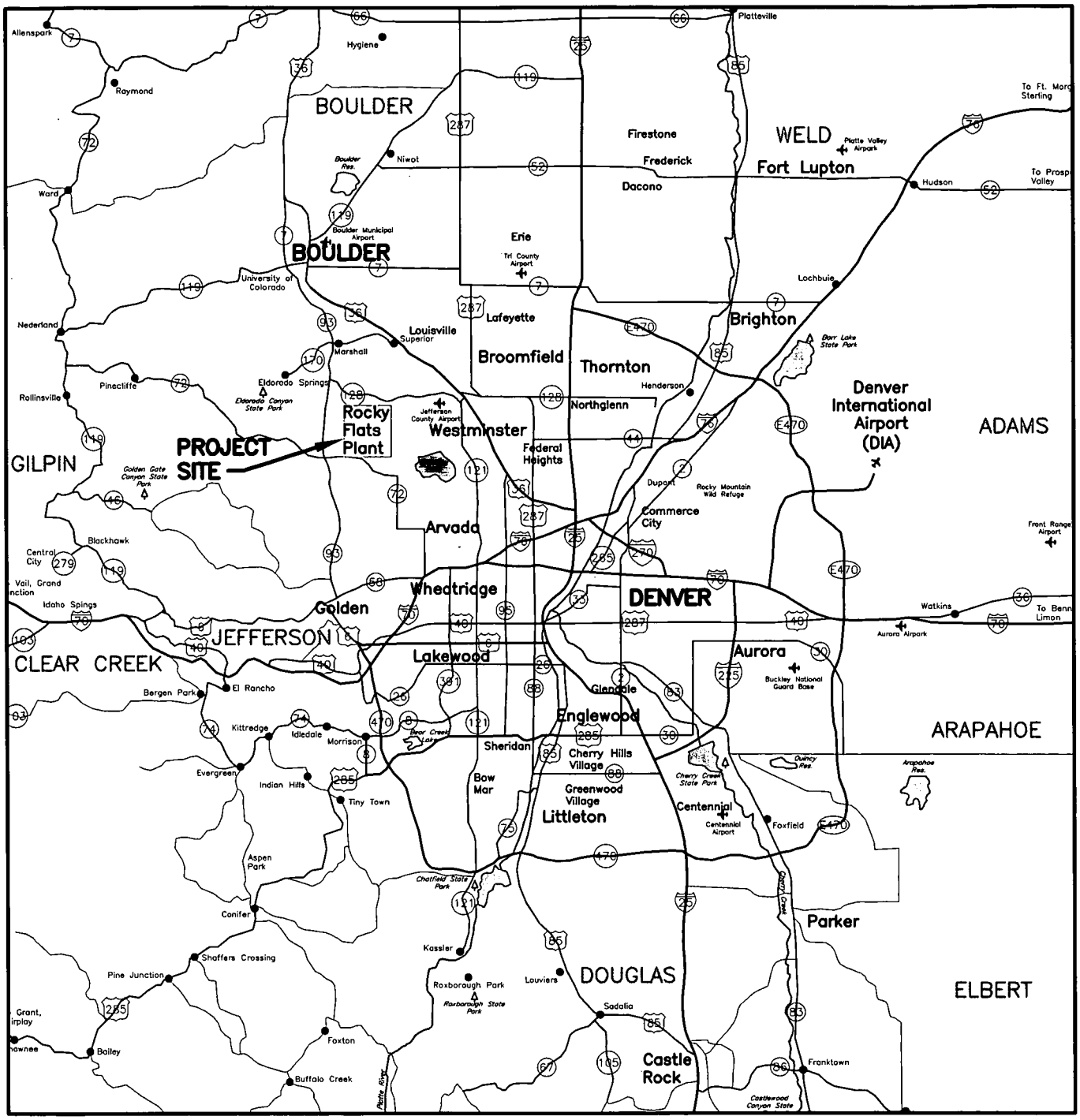
Table 6.3
Summary of Field QC Compaction Tests

Date	Test #	Wet Density (pcf)	Dry Density (pcf)	Moisture Contents		Proctor Results		Sand Cone Results		-2 to 2	> 95%	Pass/Fail	Comments
				Field MC	Oven MC	Optimum MC	Maximum DD	MC	DD	% off MC	% Comp.		
7/11/2005	QC-BF-DT-260	129.6	117.2	10.6	-	11.5	123.2			-0.9	95%	PASS	
7/11/2005	QC-BF-DT-261	137.0	121.5	12.7	12.8	11.0	123.5	12.8	125.0	1.8	98%	PASS	*Sand Cone QC-BF-SC-13 taken*
7/11/2005	QC-BF-DT-262	130.8	116.7	10.3	-	11.1	122.9			-0.8	97%	PASS	
7/11/2005	QC-BF-DT-263	134.4	122.1	10.0	-	11.1	122.9			-1.1	99%	PASS	
7/11/2005	QC-BF-DT-264	139.1	125.3	11.0	-	11.1	122.9			-0.1	102%	PASS	
7/11/2005	QC-BF-DT-265	125.2	116.0	7.9	-	11.1	122.9			-3.2	94%	FAIL	note 1 and 2; Area passed upon retesting
7/12/2005	QC-BF-DT-265A	133.2	121.5	9.6	-	11.1	122.9			-1.5	99%	PASS	
7/12/2005	QC-BF-DT-265B	131.2	118.0	11.2	-	11.1	122.9			0.1	96%	PASS	
7/11/2005	QC-BF-DT-266	136.6	121.9	12.1	-	11.1	122.9			1.0	99%	PASS	
7/11/2005	QC-BF-DT-267	133.4	122.0	9.3	-	11.1	122.9			-1.8	99%	PASS	
7/11/2005	QC-BF-DT-268	132.4	121.1	9.3	-	11.1	122.9			-1.8	99%	PASS	
7/11/2005	QC-BF-DT-269	128.7	118.3	8.8	-	11.1	122.9			-2.3	96%	FAIL	note 1; Area passed upon retesting
7/12/2005	QC-BF-DT-269A	133.7	120.0	11.4	-	11.1	122.9			0.3	98%	PASS	
7/12/2005	QC-BF-DT-269B	133.5	120.1	11.2	-	11.1	122.9			0.1	98%	PASS	
7/12/2005	QC-BF-DT-270	131.5	118.4	11.1	-	11.6	121.3			-0.5	98%	PASS	
7/12/2005	QC-BF-DT-271	136.3	122.6	11.2	-	11.6	121.3			-0.4	101%	PASS	
7/12/2005	QC-BF-DT-272	134.7	119.4	12.8	-	11.5	123.2			1.3	97%	PASS	
7/12/2005	QC-BF-DT-273	137.1	123.1	11.4	-	10.3	125.9			1.1	98%	PASS	
7/12/2005	QC-BF-DT-274	139.8	127.6	11.4	9.6	10.3	125.9	9.6	132.3	-0.7	101%	PASS	Sand Cone QC-BF-SC-14 taken
7/12/2005	QC-BF-DT-275	129.3	118.5	9.1	-	11.1	122.9			-2.0	96%	PASS	
7/12/2005	QC-BF-DT-276	125.4	113.2	10.8	-	10.5	126.9			0.3	89%	FAIL	note 2; Area passed upon retesting
7/12/2005	QC-BF-DT-276A	135.3	124.2	8.9	-	10.5	126.9			-1.6	98%	PASS	
7/12/2005	QC-BF-DT-276B	132.1	120.9	9.3	-	10.5	126.9			-1.2	95%	PASS	
7/12/2005	QC-BF-DT-277	139.4	128.6	8.3	-	10.5	126.9			-2.2	101%	FAIL	note 1; Area passed upon retesting
7/12/2005	QC-BF-DT-277A	139.7	126.0	10.9	-	10.5	126.9			0.4	99%	PASS	
7/12/2005	QC-BF-DT-277B	134.5	120.5	11.6	-	10.5	126.9			1.1	95%	PASS	
7/12/2005	QC-BF-DT-278	131.0	119.8	9.4	-	11.1	122.9			-1.7	97%	PASS	
7/12/2005	QC-BF-DT-279	132.3	119.6	10.6	-	11.1	122.9			-0.5	97%	PASS	
7/12/2005	QC-BF-DT-280	135.8	120.5	12.7	-	11.1	122.9			1.6	98%	PASS	

Note 1: Material was re-conditioned prior to retesting
Note 2: Material was re-compacted proir to retesting
MC = Moisture Content (%)
DD = Dry Density (pcf)
F:\4886_002\QC Data\QC Density Tests.xls

Table 6.4
Summary of Field QA Compaction Tests

Date	Soil ID	Test #	Wet Density (pcf)	Dry Density (pcf)	Field Moisture Contents	Proctor Results		Sand Cone Results		-2 to 2	> 95%	Pass/Fail
						Optimum MC	Maximum DD	MC	DD	% off MC	% Comp.	
6/16/2005	1	QA-BF-DT-01	139.5	124.8	11.8	12.7	119.7			-0.9	104.2%	Pass
6/17/2005	1	QA-BF-DT-02	138.1	123.0	12.3	12.7	119.7			-0.4	102.7%	Pass
6/21/2005	2	QA-BF-DT-03	140.4	126.4	11.1	10.7	123.5			0.4	102.3%	Pass
6/27/2005	2	QA-BF-DT-04	137.7	125.2	10.0	10.7	123.5			-0.7	101.4%	Pass
6/27/2005	2	QA-BF-DT-05	138.7	125.7	10.3	10.7	123.5			-0.4	101.8%	Pass
6/28/2005	2	QA-BF-DT-06	138.6	125.5	10.4	10.7	123.5			-0.3	101.7%	Pass
6/29/2005	2	QA-BF-DT-07	137.7	122.3	12.6	10.7	123.5			1.9	99.0%	Pass
6/30/2005	2	QA-BF-DT-08	137.6	124.1	10.9	10.7	123.5	11.2	126.9	0.2	100.5%	Pass
6/30/2005	2	QA-BF-DT-09	133.7	119.7	11.7	10.7	123.5			1.0	96.9%	Pass
7/1/2005	2	QA-BF-DT-10	136.9	123.4	10.9	10.7	123.5			0.2	100.0%	Pass
7/6/2005	2	QA-BF-DT-11	136.7	122.6	11.5	10.7	123.5			0.8	99.3%	Pass
7/7/2005	2	QA-BF-DT-12	140.7	126.1	11.6	10.7	123.5			0.9	102.1%	Pass
7/11/2005	2	QA-BF-DT-13	138.4	126.5	9.4	10.7	123.5			-1.3	102.4%	Pass
7/11/2005	3	QA-BF-DT-14	138.2	123.5	11.9	11.4	123.2			0.5	100.2%	Pass



U.S. DEPARTMENT OF ENERGY ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

KAISER HILL COMPANY

ORIGINAL LANDFILL ACCELERATED ACTION CONSTRUCTION COMPLETION AND CERTIFICATION REPORT

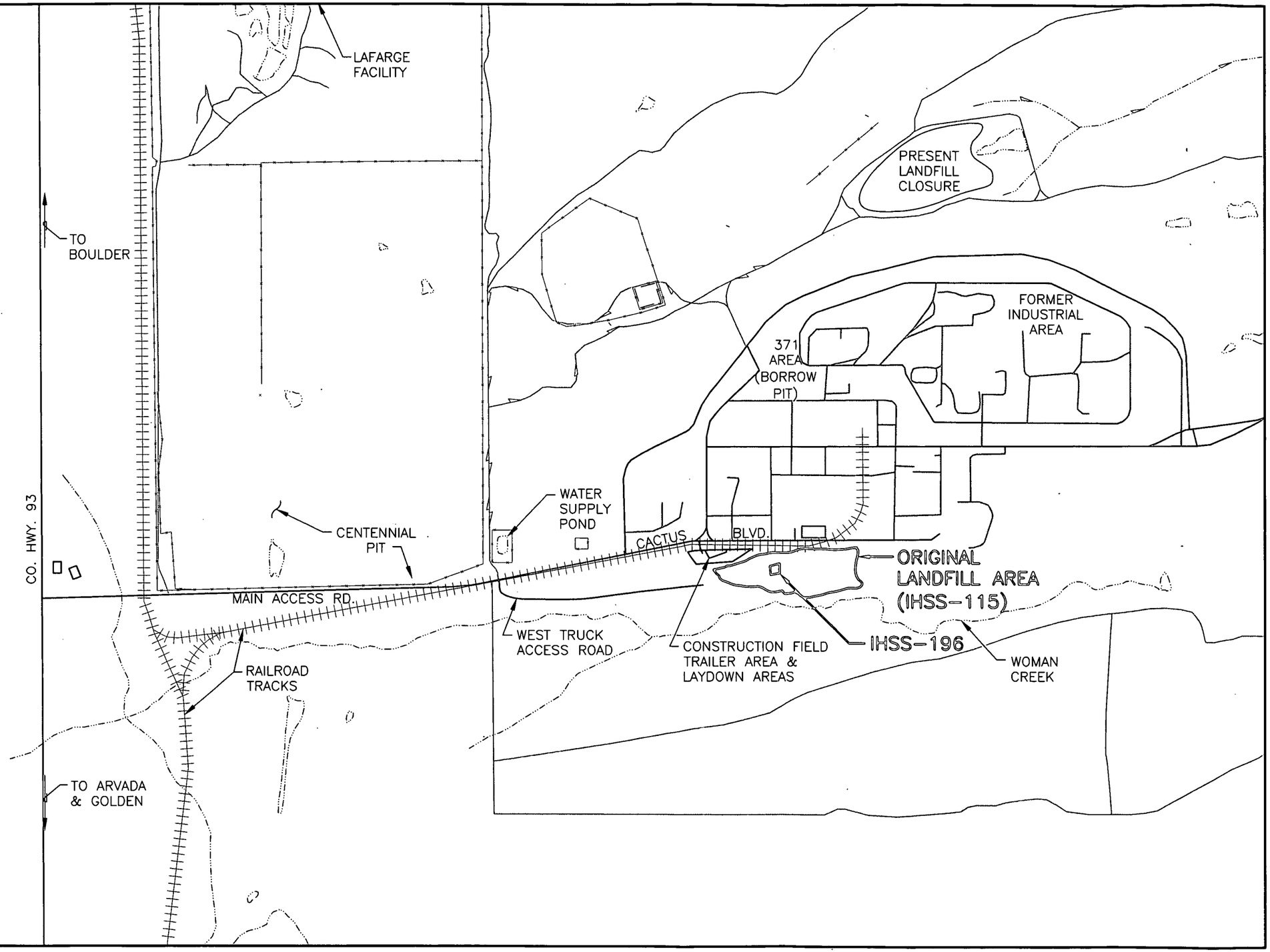
FIGURE 1

VICINITY MAP

PROJECT: 010235X	DATE: JULY 2005
REV:	BY: SCG CHECKED: JHR

TETRA TECH, INC.

F:\4586_001\OCR Report\0213-4.dwg, Map of Metro Denver, 11/22/2005 4:31:59 PM, Letter, 1:1



U.S. DEPARTMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

KAISER HILL COMPANY

ORIGINAL LANDFILL ACCELERATED ACTION CONSTRUCTION COMPLETION AND CERTIFICATION REPORT

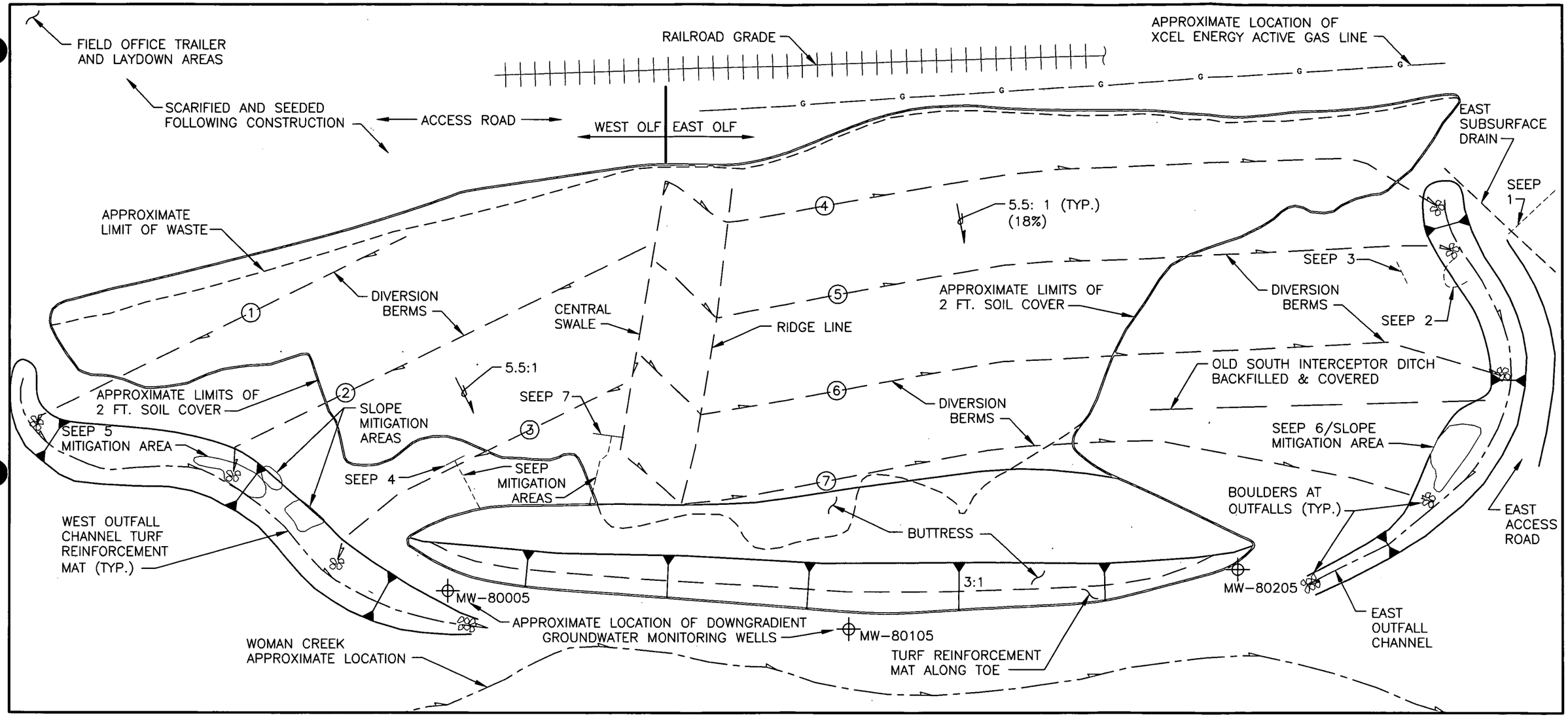
FIGURE 2

GENERAL SITE PLAN

PROJECT: 010235X	DATE: SEPTEMBER 2005
REV: NOV. 2005	BY: SCG CHECKED: JHR

TETRA TECH, INC.

F:\4686_001\OCR Report\0213-7.2pm-GENERAL PLAN, 11/22/2005 4:30:57 PM, 1:1417, 1:1



NOTE:

1. FINAL LOCATIONS SHOWN ARE APPROXIMATE. SEE AS-BUILT DRAWINGS AND FINAL RECORD SURVEY FOR EXACT LOCATIONS.

N

SCALE

120 0 120 FEET

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

KAISER HILL COMPANY

ORIGINAL LANDFILL ACCELERATED ACTION CONSTRUCTION COMPLETION AND CERTIFICATION REPORT

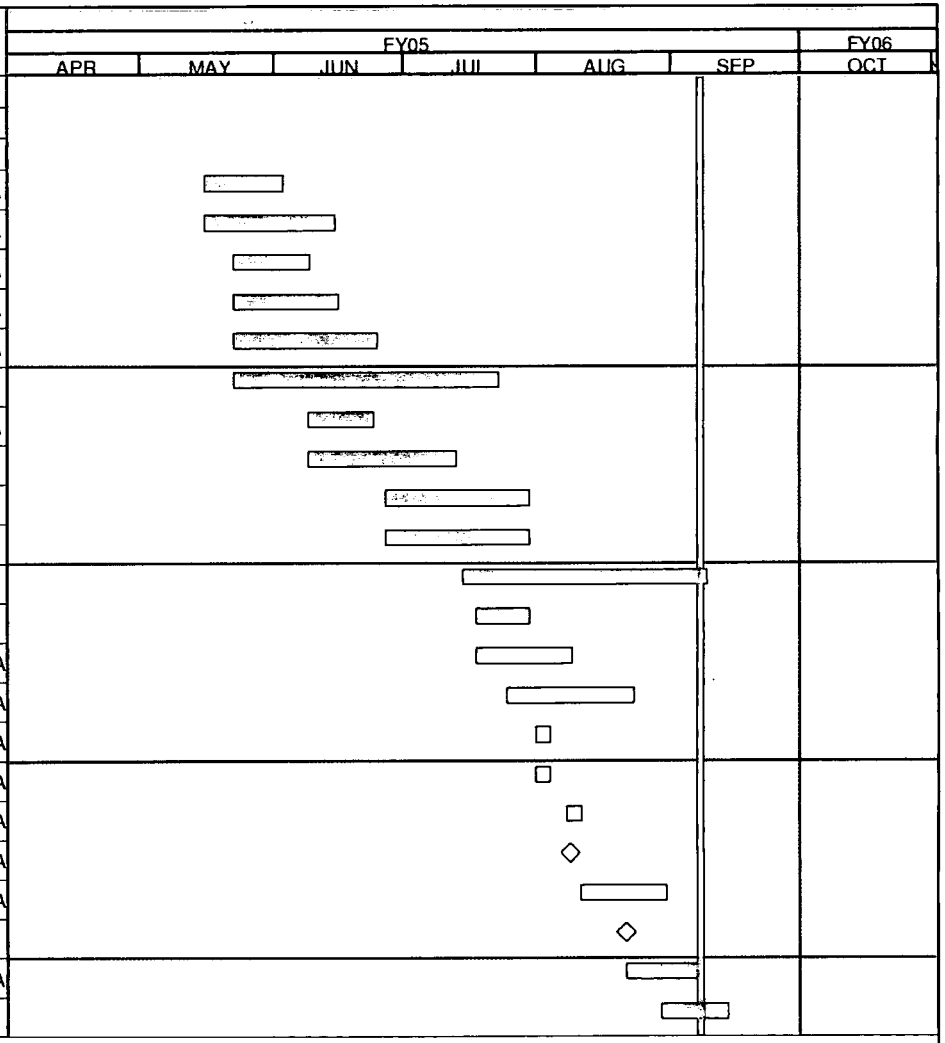
FIGURE 3

ORIGINAL LANDFILL PLAN

PROJECT: 010235X	DATE: JULY 2005	
REV: NOV. 2005	BY: SCG	CHECKED: JHR

TETRA TECH, INC.

Activity ID	Activity Description	Early Start	Early Finish
Group SW-2 Original Landfill Cap			
Sector 03			
Subsector 03A - Original Landfill			
1GCPLF2250	Pre-Compaction and Scarifying	16MAY05A	02JUN05A
1GCPLF2290	Grade Existing Soils	16MAY05A	14JUN05A
1GCPLF2188	Installation of Geogrid	23MAY05A	08JUN05A
1GCPLF2190	Installation of Drain Rock	23MAY05A	15JUN05A
1GCPLF2300	Deliver and Place Fill - Site Regrade	23MAY05A	24JUN05A
1GCPLF2310	Final Grade - Subgrade 2	23MAY05A	22JUL05A
1GCPLF2192	Installation of Geotextile	09JUN05A	23JUN05A
1GCPLF2200	Install Buttress Wall - Fill	09JUN05A	12JUL05A
1GCPLF2370	Receive Materials and Place Cap - Final Grade	27JUN05A	29JUL05A
1GCPLF2440	Excavate to Grade - Channel 1	27JUN05A	29JUL05A
1GCPLF2470	Revegetation and Erosion Protection	15JUL05A	08SEP05
1GCPLF2455	Excavate to Grade - Channel 2A&B	18JUL05A	29JUL05A
1GCPLF2380	Install Diversion Berms - Cap	18JUL05A	08AUG05A
1GCPLF1140	Prepare Org Landfill Closeout Report	25JUL05A	22AUG05A
1GCPLF2450	Final Placement of Materials - Channel 1	01AUG05A	03AUG05A
1GCPLF2458	Final Placement of Materials - Channel 2A&B	01AUG05A	03AUG05A
1GCPLF2475	Original Landfill Monitoring Well Installation	08AUG05A	10AUG05A
1GCMILE559	Original Landfill Cap Complete		08AUG05A
1GCPLF2472	OLF Channel Reinforcement	11AUG05A	30AUG05A
1GCPLF1141	Begin Org Landfill Closeout Rpt DOE Review	22AUG05A	
1GCPLF1142	DOE Review Org Landfill Closeout Report	22AUG05A	06SEP05A
1GCPLF2490	Demobilize Site	30AUG05A	13SEP05



Start Date 01FEB9
Finish Date 15DEC0
Data Date 08SEP0

KAISER HILL COMPANY

Final Detailed Schedule
Original Landfill Closure Project

Figure 4

	QUAN.	DESCRIPTION	MATERIAL

• ACCELERATED ACTION DESIGN FOR THE ORIGINAL LANDFILL

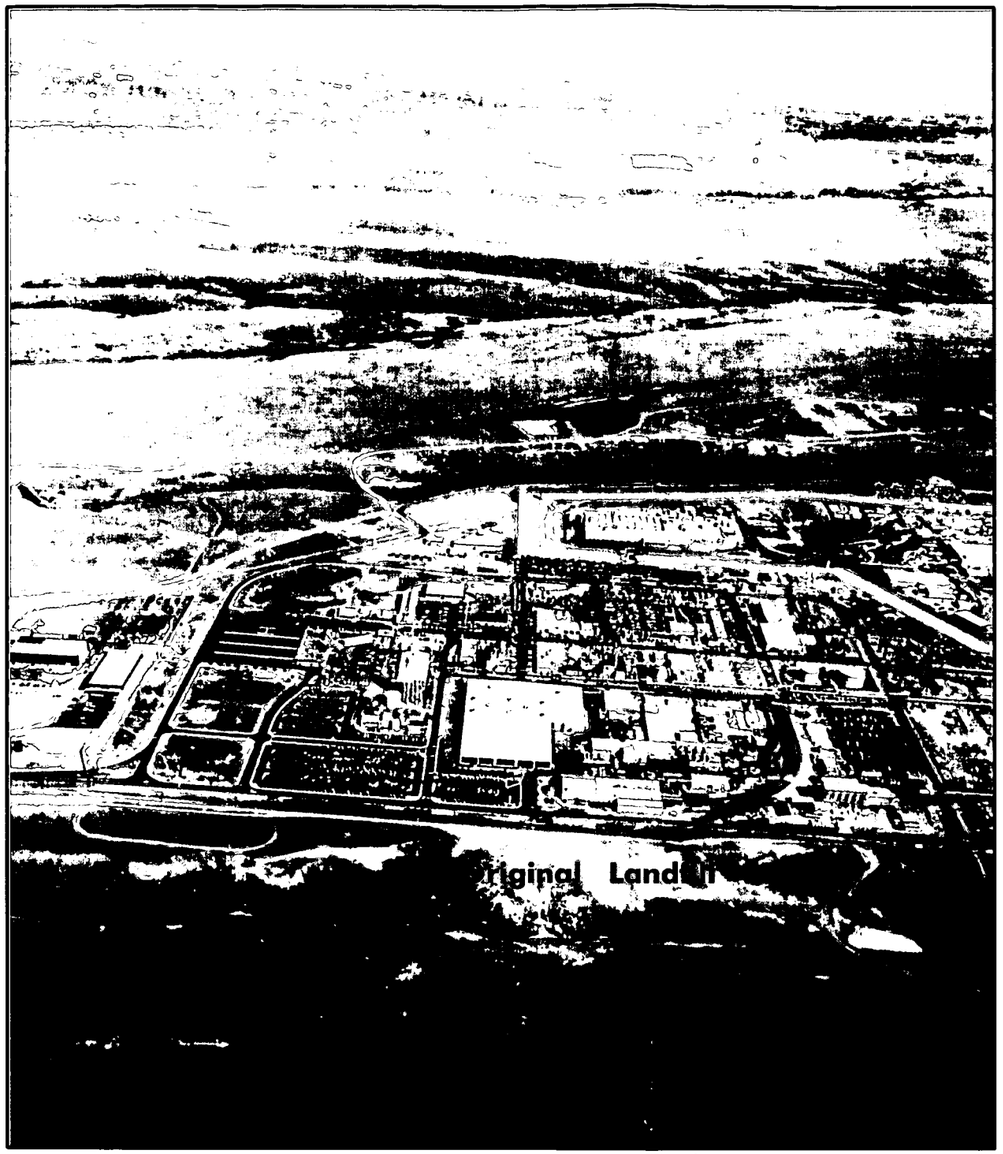
ROCKY FLATS ENVIRONMENTAL
• TECHNOLOGY SITE

DRAWINGS

GOLDEN
COLORADO

• AS-BUILT DRAWINGS
NOVEMBER 2005

FINAL COPY



AERIAL VIEW LOOKING NORTH
December 21, 1987

COLORADO REGISTERED
RANDALL C. THOMPSON
30638
11/30/05
PROFESSIONAL ENGINEER

EARTH TECH

EARTH TECH, INC.
5575 DTC PARKWAY
SUITE 200
ENGLEWOOD, CO 80111
(303) 694-6660

L:\GROUP\CAD\ROCKY_FLATS\OIF_2005\COVER2.DGN 11/21/05

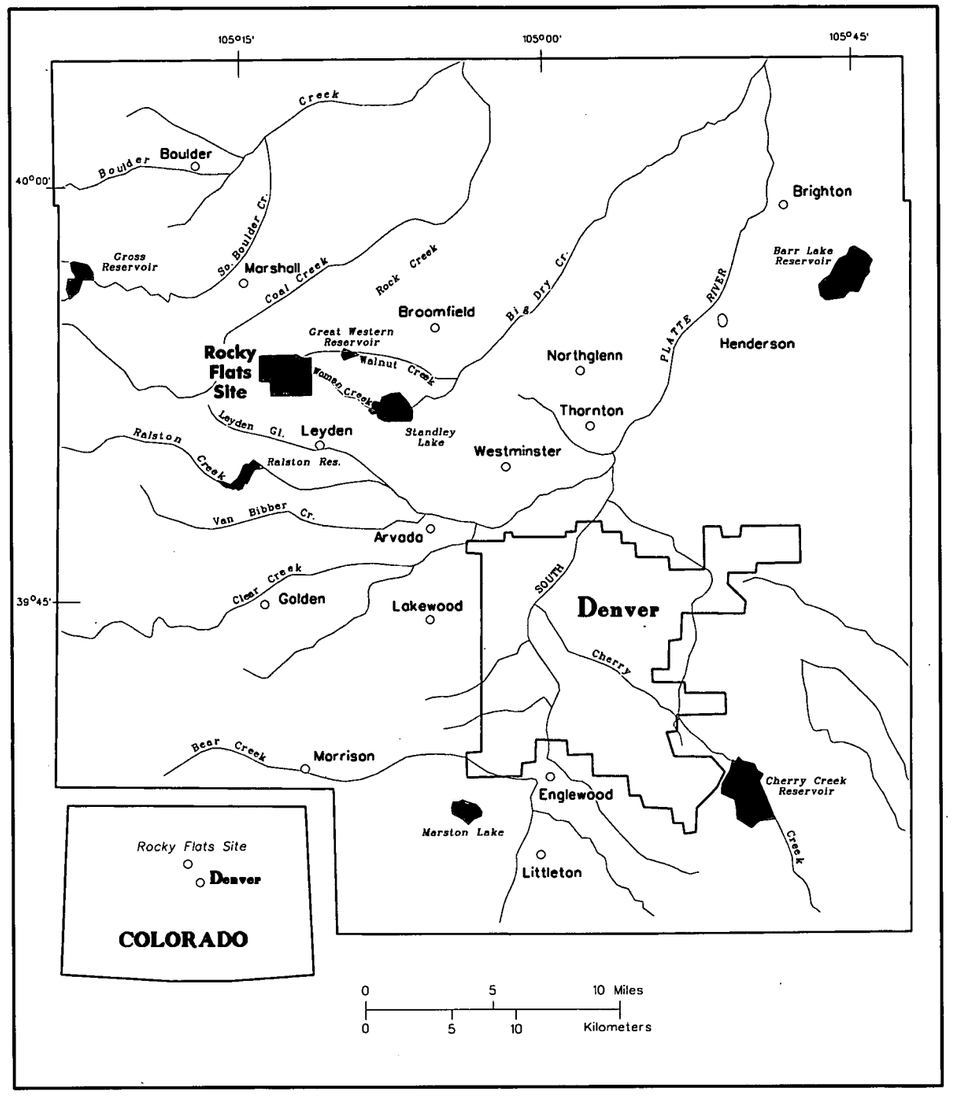
	QUAN.	DESCRIPTION	MATERIAL

AN ENGINEERED COVER FOR THE ORIGINAL LANDFILL

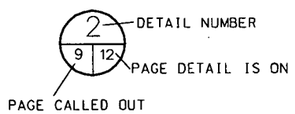
SHEET INDEX

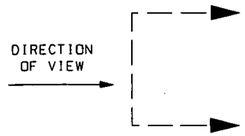
SHEET NO.	DESCRIPTION
51788-X001	RFETS OLF COVER SHEET
51788-001	VICINITY MAP AND DRAWING INDEX
51788-002	PRE-CLOSURE CONDITIONS
51788-003	BUTTRESS FOOTING EXCAVATION
51788-004	BUTTRESS CONSTRUCTION GRADES
51788-005	CUT/FILL ISOPACH OF SUBGRADE ONE SURFACE
51788-006	DESIGN TOP OF SUBGRADE TWO FINAL CONTOURS
51788-007	DESIGN TOP OF FINAL COVER CONTOURS
51788-008	DESIGN CHANNELS
51788-009	SURFACE WATER MANAGEMENT PLAN
51788-010	LANDFILL WIDE CROSS SECTIONS
51788-011	LANDFILL COVER DETAILS BUTTRESS CONSTRUCTION
51788-012 (A&B)	LANDFILL COVER DETAILS SURFACE WATER CONTROLS
51788-013	BUTTRESS CROSS SECTIONS
51788-014	FINAL COVER PERIMETER TIE IN DETAILS
51788-015A	TYPICAL WEST CHANNEL CROSS SECTIONS
51788-015B	TYPICAL EAST CHANNEL CROSS SECTIONS

VICINITY MAP



DETAIL DESIGNATION





FINAL COPY

1 ISSUE	AS-BUILT DRAWING	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	RJ CHKD	RA IV	RJ APVD	CLASS	PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE									

REVISION DESCRIPTION

PROJECT/WCF NO. 020525

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

KEYWORDS

1.
2.
3.
4.
5.

BLDG./FACILITY SITE

ROOM/AREA NA

GRID COORD./COL NO. NA

TOLERANCES
FRACT. :
ANGLE
DEC. :
UNLESS NOTED OTHERWISE

REMOVE BURRS AND SHARP EDGES

NEXT ASSEMBLY NA

SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH		
DESIGNED BY		
R. THOMPSON	RJT	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. ARCHIBALD	RA	5/12/05
INDEPENDENT VERIFIER		
S. LAWRENCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	RJT	5/12/05

CLASSIFIER

VICINITY MAP AND DRAWING INDEX
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-001	1

L:\GROUP\CAD\ROCKY_FLATS\OLF_2005\LOCATION\LOCATION2.DGN 9/21/05

	QUAN.	DESCRIPTION	MATERIAL

ABANDONED VITRIFIED CLAY DRAIN PIPE ABANDONED BY OTHERS AS PER RFETS SOP (NOT FOUND DURING CONSTRUCTION)

TO BUILDING 460 (DEMOLISHED)

TO BUILDING 444 (DEMOLISHED)

APPROXIMATE LOCATION OF DRAIN PIPES GROUTED AS PER RFETS PROCEDURES

"CACTUS AVE. & 1st AVE."

"CACTUS AVE. & 2nd AVE."

"CACTUS AVE. & 3rd AVE."

CACTUS AVE.

STORM INLET

DIRT ROAD

CLUSTER OF 3 WELLS

SURFACE WATER MONITORING

RIP RAP

DITCH

WOMAN CREEK

TP-1

TP-2

B-8

B-9

57894

59593

59393

59994

57594

59793

57394

58094

58994

LEGEND

- APPROIXAME LIMIT OF WASTE
- ℄ WOMAN CREEK
- FLOOD (100 YEAR)
- UNDERGROUND GAS LINE MARKER
- BOREHOLE OR TEST PIT
- MONITORING WELL ABANDONED
- CONCRETE PAD
- UTILITY POLE
- UTILITY POLE (STUB)
- OVERHEAD WIRE
- RAILROAD TRACK
- RIP RAP
- DIRT ROAD
- GN — NATURAL GAS LINE

NOTES:

- ELEVATIONS SHOWN HEREON ARE BASED UPON THE "ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE - SURVEYING CONTROL MAP" DRAWING NO. 15501-0150, DATED 6/6/00. INFORMATION PROVIDED BY MONTGOMERY-PHILLIPS, INC. LAND SURVEYING.
- CONTOUR LINES ARE AT TWO (2) FOOT INTERVALS.
- FIELD WORK WAS DONE IN JANUARY OF 2004.
- GAS LINE PIPELINE PIN FLAT ELEVATIONS ARE AT EXISTING GROUND SURFACE.
- DEPTHS REPORTED AS LABELED ON PIN FLAGS.

N

0' 70 140'

GROUP\CAD\ROCKY_FLATS\Olf_2005\EXISTCOND\EXISTCON1.dgn Date: 8-2005

FINAL COPY

1 ISSUE	AS-BUILT DRAWING	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DJB DWN	RJ CHKD	RJ LV	RJ APVD	CLASS 57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE								

REVISION DESCRIPTION

DESCRIPTION

PROJECT/WCF NO. 020525

KEYWORDS
1.
2.
3.
4.
5.
BLDG./FACILITY
ROOM/AREA
GRID COORD./COL NO.

TOLERANCES
FRACT. ±
ANGLE
DEC. ±
UNLESS NOTED OTHERWISE

REMOVE BURRS AND SHARP EDGES

NEXT ASSEMBLY

SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH

DESIGNED BY		
R. THOMPSON	RJ	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. ARCHIBALD	RA	5/12/05
INDEPENDENT VERIFIER		
S. LANGANCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	RJ	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

PRE-CLOSURE CONDITIONS

ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-002	1

CONSTRUCTION CONTROL POINTS

POINT NUMBER	NORTH COORDINATE	EAST COORDINATE	DESIGN ELEVATION
6000	747566.3	2081298.6	5974
6001	747560.2	2081308.2	5972
6002	747554	2081316	5970
6003	747548	2081320.7	5968
6004	747541.8	2081327	5966
6005	747535.7	2081335.2	5964
6006	747529.5	2081345.5	5962
6007	747523.3	2081358.8	5960
6008	747516.9	2081381.7	5958
6009	747510.5	2081400.9	5956
6010	747504.2	2081423.2	5954
6011	747497.5	2081458.6	5952
6012	747491.3	2081474.4	5950
6013	747486	2081612.8	5948
6014	747483	2081716.8	5946
6015	747478.6	2081775.4	5944
6016	747474	2081828.2	5942
6017	747471.2	2081882.4	5940
6018	747472.2	2081980.8	5938
6019	747474.5	2082056.3	5936
6020	747475.5	2082120	5934
6021	747480.5	2082164.8	5934
6022	747517.2	2082293.5	5934
6023	747531.5	2082321.8	5936
6024	747540.5	2082331.6	5938
6025	747549	2082339.7	5940
6026	747566.3	2081350	
6027	747571	2081400	
6028	747578.3	2081450	
6029	747581.3	2081500	
6030	747581.3	2081550	
6031	747581.3	2081600	
6032	747581.3	2081650	
6033	747581.3	2081700	
6034	747581.3	2081750	
6035	747581.2	2081800	
6036	747581.3	2081850	
6037	747581.3	2081900	
6038	747581.3	2081950	
6039	747581.3	2082000	
6040	747581.3	2082050	
6041	747581.3	2082100	
6042	747581.3	2082150	
6043	747574.9	2082200	
6044	747567.7	2082250	
6045	747560.5	2082300	
6046	747587.6	2081350	
6047	747608.3	2081400	
6048	747630.9	2081450	
6049	747650	2081489.7	
6050	747654.8	2081500	
6051	747668.9	2081550	
6052	747658.8	2081600	
6053	747665.2	2081650	
6054	747675.5	2081700	
6055	747671.9	2081750	
6056	747666.9	2081800	
6057	747660.5	2081850	
6058	747650	2081900	
6059	747637.3	2081950	
6060	747628.2	2082000	
6061	747648.5	2082050	
6062	747654.5	2082063	Grade Break
6063	747645.1	2082100	
6064	747636.1	2082150	
6065	747633.1	2082200	
6066	747601.1	2082250	
6067	747575.8	2082300	

Borehole or test pit	Depth to First Granular Soils (alluvium)	Depth from Surface to Weathered Bedrock
B-8	8.0	14.5
B-9	6.0	6.5
TP-2	4.0	6.5
TP-1	0.0	12.5
58994	0.0	4.5
59094	0.0	11.5
57394	0.0	7.4
57594	silt and clay to bedrock	16.5
59393	0.5	7.5
57894	3.2	>10
59593	3.0	14.4
59793	9.3	13.3
58094	0.0	10

LEGEND

- BOREHOLE/TEST PITS
- APPROXIMATE LOCATION OF TEMPORARY DEWATERING SUMP
- APPROXIMATE LOCATION OF GEOTEXTILE ANCHOR TRENCH
- APPROXIMATE LIMIT OF REGRADING ACTIVITIES
- GRAVEL ROAD
- APPROXIMATE LIMIT OF WASTE
- 10 FOOT CONTOUR
- 2 FOOT CONTOUR
- N 40000 / E 20000 GRID COORDINATE SYSTEM

SEE DRAWING - 011 FOR SECTION

NOTES:

The footprint surface was prepared by stripping and removing all vegetation, root matter, and other organics and deleterious materials. In addition to stripping, soft, unconsolidated fine-grained alluvial materials (such as Unified Soil Classification System CH, CL, ML materials), particularly highly plastic clays, were removed to a firm/dense condition judged suitable for the buttress foundation, as determined in the field during construction by a site engineer or geologist. The final foundation surface was in a condition to accept installation of the geogrid per manufacturers recommendations All final foundation surfaces were approved by the site engineer or geologist prior to placement of materials for buttress and blanket drain construction.

0' 60' 120'

*Actual limits and elevations of buttress footing excavation are shown on Flatirons Surveying record drawings.

FINAL COPY

AS-BUILT DRAWING WITH MODIFICATIONS PER CCR COMMENTS.

ISSUE	DESCRIPTION	DATE	DSGN	DWN	CHKD	IV	APVD	CLASS	PROJECT/CHARGE NO.
2	EARTH TECH DESIGN COMPANY	11/30/05	SP	DB	RT	RA	RT		57378
0	ORIGINAL ISSUE								

PROJECT/WCF NO. 020525

KEYWORDS

1. 2. 3. 4. 5.

BLDG./FACILITY

ROOM/AREA

GRID COORD./COL NO.

TOLERANCES: FRACT. ±, ANGLE ±, DEC. ±, UNLESS NOTED OTHERWISE

REMOVE BURRS AND SHARP EDGES

NEXT ASSEMBLY

SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH		
DESIGNED BY	R. THOMPSON	5/12/05
DRAWN BY	A. SHOTNIK	5/12/05
CHECKED BY	R. ARCHIBALD	5/12/05
INDEPENDENT VERIFIER	S. LAWRENCE	5/12/05
APPROVED BY	R. THOMPSON	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

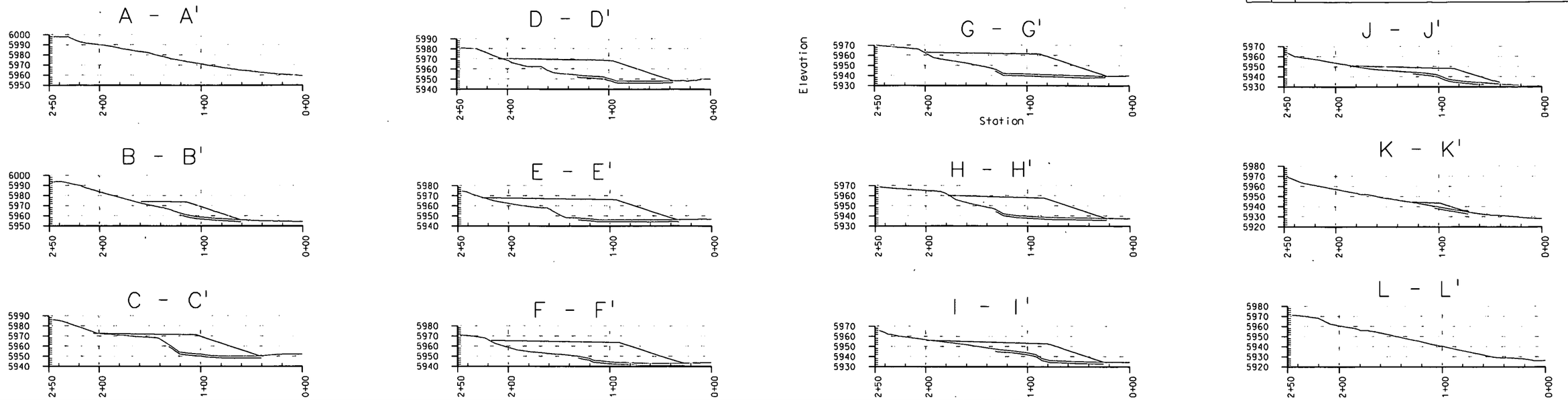
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

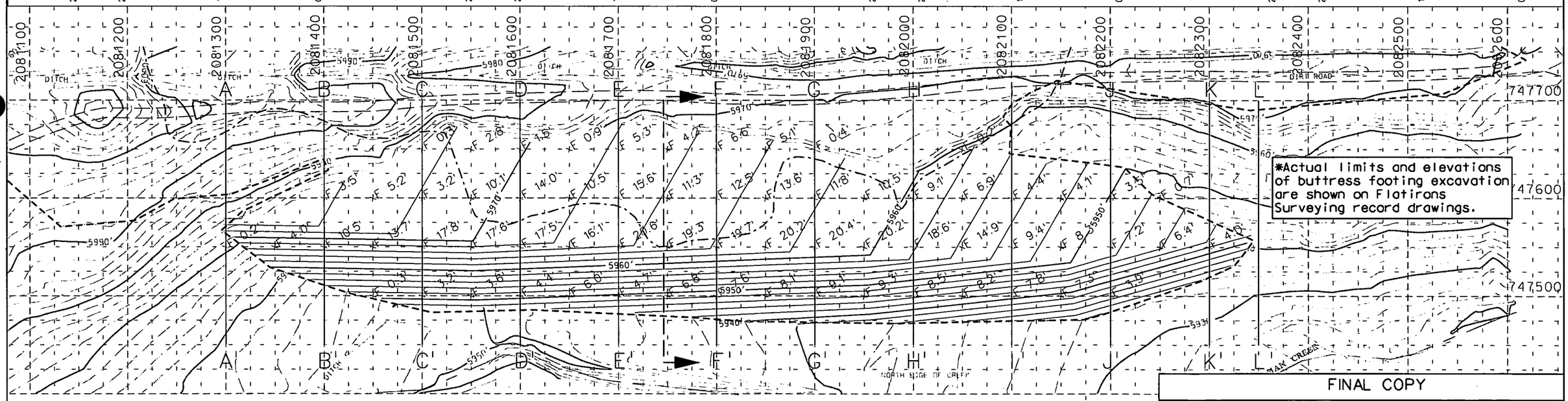
BUTTRESS FOOTING EXCAVATION
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-003	2

L:\GROUP\CAD\ROCKY_FLATS\Olf_2005\ExistCond\ExDn2ft1.dgn Date: 11-2005

	QUAN.	DESCRIPTION	MATERIAL





LEGEND

- APPROXIMATE LIMIT OF REGRADING ACTIVITIES
- GRAVEL ROAD
- APPROXIMATE LIMIT OF WASTE
- 10 FOOT CONTOUR
- 2 FOOT CONTOUR
- N 40000 E 20000 GRID COORDINATE SYSTEM

LINE	SURFACE
———	Buttress
———	Existing Surface
———	Existing Surface Dropped 2ft*

Scaled 1.00 Times Ver.
Scaled 1.00 Times Hor.

N

0' 50 100'

FINAL COPY

1 ISSUE	AS-BUILT DRAWING										
	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	RJ CHKD	RA IV	RJ APVD			CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE										

DESCRIPTION

PROJECT/WCF NO. 020525

KEYWORDS
1.
2.
3.
4.
5.
BLDG./FACILITY
ROCKY/AREA
GRID COORD./COL NO.

TOLERANCES
FRACT. ±
ANGLE ±
DEC. ±
UNLESS NOTED OTHERWISE
REMOVE BURRS AND SHARP EDGES
NEXT ASSEMBLY
SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH

DESIGNED BY		
R. THOMPSON	RJ	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. ARCHIBALD	RA	5/12/05
INDEPENDENT VERIFIER		
S. LAWERANCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	RJ	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

BUTTRESS CONSTRUCTION GRADES
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-004	1

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CONSTRUCTION ACTIVITES COORDINATED WITH WASTE STORAGE-AREA ACTIVITIES

REGRADE ACTIVITES COORDINATED WITH RAILROAD LOADING ACTIVITIES

APPROXIMATE LOCATION OF EXCEL HIGH PRESSURE ACTIVE GAS LINE - SEE FLATIRONS SURVEYING RECORD DRAWINGS

ABANDONED EXCEL 10" NATURAL GAS PIPELINE REMOVED AS NECESSARY. REMAINING PIPE SEALED AS PER RFETS SOP

AREA FILLED DURING BUTTRESS CONSTRUCTION

BUTTRESS FILL

SEE FLATIRONS SURVEYING RECORD DRAWINGS FOR ACTUAL SUBGRADE ONE ELEVATIONS AND PIPE ABANDONMENT LOCATIONS.

LIMIT OF WASTE AREA = 10.3 Acres
INSIDE 1 FOOT DROP OF REGRADES = 9.6 Acres

LEGEND

- APPROXIMATE LIMIT OF REGRADING ACTIVITIES
- APPROXIMATE LIMIT OF WASTE
- C 1.0' CUT DEPTH
- F 1.0' FILL DEPTH
- 0' ZERO CUT/FILL LINE
- GN NATURAL GAS LINE
- GRAVEL ROAD
- 10 FOOT CONTOUR
- 2 FOOT CONTOUR
- UNDERGROUND GAS LINE MARKER
- MONITORING WELL
- CONCRETE PAD
- UTILITY POLE
- UTILITY POLE (STUB)
- OHW OVERHEAD WIRE
- RAILROAD TRACK
- RIP RAP
- N 40000 E 20000 GRID COORDINATE SYSTEM

NOTES:

* REGRADED WASTE REMAINED WITHIN THE APPROXIMATE LIMITS OF WASTE.
* DEBRIS FOUND OUTSIDE OF THE "LIMITS OF WASTE" WAS EXCAVATED AND PLACED WITHIN THE "LIMITS OF WASTE" BOUNDARY.
* ELEVATIONS SHOWN HEREON ARE BASED UPON THE "ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE - SURVEYING CONTROL MAP" DRAWING NO. 15501-0150, DATED 6/6/00. INFORMATION PROVIDED BY MONTGOMERY-PHILLIPS, INC. LAND SURVEYING.
* CONTOUR LINES ARE AT TWO (2) FOOT INTERVALS.
* INVESTIGATION FIELD WORK WAS DONE IN JANUARY OF 2004.
* GAS LINE PIPELINE PIN FLAT ELEVATIONS ARE AT EXISTING GROUND SURFACE.
* DEPTHS REPORTED AS LABLED ON PIN FLAGS.

N

0' 60 120'

QUAN.	DESCRIPTION	MATERIAL

FINAL COPY

1 ISSUE	AS-BUILT DRAWING								CLASS	57378 PROJECT/CHARGE NO.
	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	RJ CHKD	RA IV	RJ APVD			
0 ISSUE	ORIGINAL ISSUE									PROJECT/WCF NO. 020525

DESCRIPTION

KEYWORDS

1.
2.
3.
4.
5.

BLDG./FACILITY

ROOM/AREA

GRID COORD./COL NO.

TOLERANCES: FRACT. ±; ANGLE ±; DEC. ±; UNLESS NOTED OTHERWISE

REMOVE BURRS AND SHARP EDGES

HEAT ASSEMBLY

SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH		
DESIGNED BY		
R. THOMPSON	RJT	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. ARCHIBALD	RA	5/12/05
INDEPENDENT VERIFIER		
S. LAWRENCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	RJT	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

CUT/FILL ISOPACH OF SUBGRADE ONE SURFACE

ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

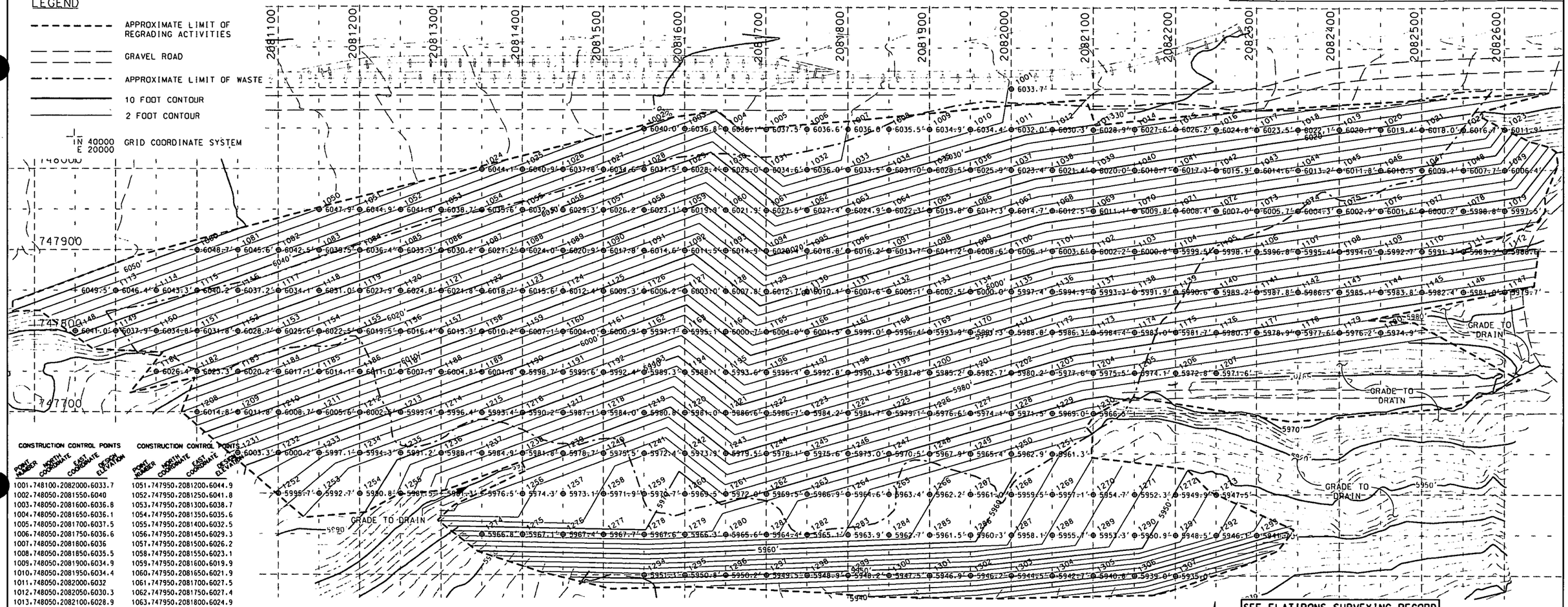
SIZE	DRAWING NUMBER	ISSUE
B	51788-005	1

L:\GROUP\CAD\ROCKY_FLATS\Olf_2005\CutFill-6aLess1A.dgn Date: 8-2005

LEGEND

- APPROXIMATE LIMIT OF REGRADING ACTIVITIES
- GRAVEL ROAD
- APPROXIMATE LIMIT OF WASTE
- 10 FOOT CONTOUR
- 2 FOOT CONTOUR
- N 40000 E 20000 GRID COORDINATE SYSTEM

QUAN.	DESCRIPTION	MATERIAL



CONSTRUCTION CONTROL POINTS

POINT NUMBER	NORTH COORDINATE	EAST COORDINATE	DESIGN ELEVATION
1001	748100	2082000	6033.7
1002	748050	2081550	6040
1003	748050	2081600	6035.8
1004	748050	2081650	6036.1
1005	748050	2081700	6037.5
1006	748050	2081750	6036.6
1007	748050	2081800	6036
1008	748050	2081850	6035.5
1009	748050	2081900	6034.9
1010	748050	2081950	6034.4
1011	748050	2082000	6032
1012	748050	2082050	6030.3
1013	748050	2082100	6028.9
1014	748050	2082150	6027.6
1015	748050	2082200	6026.2
1016	748050	2082250	6024.8
1017	748050	2082300	6023.5
1018	748050	2082350	6022.1
1019	748050	2082400	6020.7
1020	748050	2082450	6019.4
1021	748050	2082500	6018
1022	748050	2082550	6016.7
1023	748050	2082600	6011.9
1024	748000	2081350	6044.1
1025	748000	2081400	6040.9
1026	748000	2081450	6037.8
1027	748000	2081500	6034.6
1028	748000	2081550	6031.5
1029	748000	2081600	6028.4
1030	748000	2081650	6029
1031	748000	2081700	6034.6
1032	748000	2081750	6036
1033	748000	2081800	6033.5
1034	748000	2081850	6031
1035	748000	2081900	6028.5
1036	748000	2081950	6025.9
1037	748000	2082000	6023.4
1038	748000	2082050	6021.4
1039	748000	2082100	6020
1040	748000	2082150	6018.7
1041	748000	2082200	6017.3
1042	748000	2082250	6015.9
1043	748000	2082300	6014.6
1044	748000	2082350	6013.2
1045	748000	2082400	6011.8
1046	748000	2082450	6010.5
1047	748000	2082500	6009.1
1048	748000	2082550	6007.7
1049	748000	2082600	6006.4
1050	747950	2081150	6047.9
1051	747950	2081200	6044.9
1052	747950	2081250	6041.8
1053	747950	2081300	6038.7
1054	747950	2081350	6035.6
1055	747950	2081400	6032.5
1056	747950	2081450	6029.3
1057	747950	2081500	6026.2
1058	747950	2081550	6023.1
1059	747950	2081600	6019.9
1060	747950	2081650	6021.9
1061	747950	2081700	6027.5
1062	747950	2081750	6027.4
1063	747950	2081800	6024.9
1064	747950	2081850	6022.3
1065	747950	2081900	6019.8
1066	747950	2081950	6017.3
1067	747950	2082000	6014.7
1068	747950	2082050	6012.5
1069	747950	2082100	6011.1
1070	747950	2082150	6009.8
1071	747950	2082200	6008.4
1072	747950	2082250	6007
1073	747950	2082300	6005.7
1074	747950	2082350	6004.3
1075	747950	2082400	6002.9
1076	747950	2082450	6001.6
1077	747950	2082500	6000.2
1078	747950	2082550	5998.8
1079	747950	2082600	5997.5
1080	747900	2081000	6048.7
1081	747900	2081050	6045.6
1082	747900	2081100	6042.5
1083	747900	2081150	6039.5
1084	747900	2081200	6036.4
1085	747900	2081250	6033.3
1086	747900	2081300	6030.2
1087	747900	2081350	6027.2
1088	747900	2081400	6024
1089	747900	2081450	6020.9
1090	747900	2081500	6017.8
1091	747900	2081550	6014.6
1092	747900	2081600	6011.5
1093	747900	2081650	6014.5
1094	747900	2081700	6020.4
1095	747900	2081750	6018.8
1096	747900	2081800	6016.2
1097	747900	2081850	6013.7
1098	747900	2081900	6011.2
1099	747900	2081950	6008.6
1100	747900	2082000	6006.1
1101	747900	2082050	6003.6
1102	747900	2082100	6002.2
1103	747900	2082150	6000.8
1104	747900	2082200	5999.5
1105	747900	2082250	5998.1
1106	747900	2082300	5996.8
1107	747900	2082350	5995.4
1108	747900	2082400	5994
1109	747900	2082450	5992.7
1110	747900	2082500	5991.3
1111	747900	2082550	5989.9
1112	747900	2082600	5988.6
1113	747850	2080900	6046.4
1114	747850	2080950	6043.3
1115	747850	2081000	6040.2
1116	747850	2081050	6037.2
1117	747850	2081100	6034.1
1118	747850	2081150	6031
1119	747850	2081200	6027.9
1120	747850	2081250	6024.8
1121	747850	2081300	6021.8
1122	747850	2081350	6018.7
1123	747850	2081400	6015.6
1124	747850	2081450	6012.4
1125	747850	2081500	6009.3
1126	747850	2081550	6006.2
1127	747850	2081600	6003
1128	747850	2081650	6007.8
1129	747850	2081700	6012.7
1130	747850	2081750	6010.1
1131	747850	2081800	6007.6
1132	747850	2081850	6005.1
1133	747850	2081900	6002.5
1134	747850	2081950	6000
1135	747850	2082000	5997.4
1136	747850	2082050	5994.9
1137	747850	2082100	5993.3
1138	747850	2082150	5991.9
1139	747850	2082200	5990.6
1140	747850	2082250	5989.2
1141	747850	2082300	5987.8
1142	747850	2082350	5986.5
1143	747850	2082400	5985.1
1144	747850	2082450	5983.8
1145	747850	2082500	5982.4
1146	747850	2082550	5981.1
1147	747850	2082600	5979.7
1148	747800	2080850	6041
1149	747800	2080900	6037.9
1150	747800	2080950	6034.8
1151	747800	2081000	6031.8
1152	747800	2081050	6028.7
1153	747800	2081100	6025.6
1154	747800	2081150	6022.5
1155	747800	2081200	6019.5
1156	747800	2081250	6016.4
1157	747800	2081300	6013.3
1158	747800	2081350	6010.2
1159	747800	2081400	6007.1
1160	747800	2081450	6004
1161	747800	2081500	6000.9
1162	747800	2081550	5997.7
1163	747800	2081600	5995.1
1164	747800	2081650	6000.7
1165	747800	2081700	6004
1166	747800	2081750	6001.5
1167	747800	2081800	5999
1168	747800	2081850	5996.4
1169	747800	2081900	5993.9
1170	747800	2081950	5991.3
1171	747800	2082000	5988.8
1172	747800	2082050	5986.3
1173	747800	2082100	5984.4
1174	747800	2082150	5983
1175	747800	2082200	5981.7
1176	747800	2082250	5980.3
1177	747800	2082300	5978.9
1178	747800	2082350	5977.6
1179	747800	2082400	5976.2
1180	747800	2082450	5974.9
1181	747750	2080950	6026.4
1182	747750	2081000	6023.3
1183	747750	2081050	6020.2
1184	747750	2081100	6017.1
1185	747750	2081150	6014.1
1186	747750	2081200	6011
1187	747750	2081250	6007.9
1188	747750	2081300	6004.8
1189	747750	2081350	6001.8
1190	747750	2081400	5998.7
1191	747750	2081450	5995.6
1192	747750	2081500	5992.4
1193	747750	2081550	5989.3
1194	747750	2081600	5988.1
1195	747750	2081650	5993.6
1196	747750	2081700	5995.4
1197	747750	2081750	5992.8
1198	747750	2081800	5990.3
1199	747750	2081850	5987.8
1200	747750	2081900	5985.2
1201	747750	2081950	5982.7
1202	747700	2080900	5980.2
1203	747750	2082050	5977.6
1204	747750	2082100	5975.5
1205	747750	2082150	5974.1
1206	747750	2082200	5972.8
1207	747750	2082250	5971.6
1208	747700	2081000	6014.8
1209	747700	2081050	6011.8
1210	747700	2081100	6008.7
1211	747700	2081150	6005.6
1212	747700	2081200	6002.5
1213	747700	2081250	5999.4
1214	747700	2081300	5996.4
1215	747700	2081350	5993.4
1216	747700	2081400	5990.2
1217	747700	2081450	5987.1
1218	747700	2081500	5984
1219	747700	2081550	5980.8
1220	747700	2081600	5981
1221	747700	2081650	5986.6
1222	747700	2081700	5986.7
1223	747700	2081750	5984.2
1224	747700	2081800	5981.7
1225	747700	2081850	5979.1
1226	747700	2081900	5976.6
1227	747700	2081950	5974.1
1228	747700	2082000	5971.5
1229	747700	2082050	5969
1230	747700	2082100	5966.5
1231	747650	2081050	6003.3
1232	747650	2081100	6000.2
1233	747650	2081150	5997.1
1234	747650	2081200	5994.1
1235	747650	2081250	5991.2
1236	747650	2081300	5988.1
1237	747650	2081350	5984.9
1238	747650	2081400	5981.8
1239	747650	2081450	5978.7
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1241	747650	2081550	5972.4
1242	747650	2081600	5973.9
1243	747650	2081650	5979.5
1244	747650	2081700	5978.1
1245	747650	2081750	5975.6
1246	747650	2081800	5973
1247	747650	2081850	5970.5
1248	747650	2081900	5967.9
1249	747650	2081950	5965.4
1250	747650	2082000	5962.9
1251	747650	2082050	5961.3
1252	747600	2081100	5995.7
1253	747600	2081150	5992.7
1254	747600	2081200	5990.8
1255	747600	2081250	5987.5
1256	747600	2081400	5974.3
1257	747600	2081450	5973.1
1258	747600	2081500	5971.9
1259	747600	2081550	5970.7
1260	747600	2081600	5969.5
1261	747600	2081650	5972
1262	747600	2081700	5969.5
1263	747600	2081750	5966.9
1264	747600	2081800	5964.6
1265	747600	2081850	5963.4
1266	747600	2081900	5962.2
1267	747600	2081950	5961
1268	747600	2082000	5959.5
1269	747600	2082050	5957.1
1270	747600	2082100	5954.7
1271	747600	2082150	5952.3
1272	747600	2082200	5949.9
1273	747600	2082250	5947.5
1274	747550	2081350	5966.8
1275	747550	2081400	5967.1
1276	747550	2081450	5967.4
1277	747550	2081500	5967.7
1278	747550	2081550	5967.6
1279	747550	2081600	5966.3
1280	747550	2081650	5965.6
1281	747550	2081700	5964.4
1282	747550	2081750	5965.1
1283	747550	2081800	5963.9
1284	747550	2081850	5962.7
1285	747550	2081900	5961.5
1286	747550	2081950	5960.3
1287	747550	2082000	5958.1
1288	747550	2082050	5955.7
1289	747550	2082100	5953.3
1290	747550	2082150	5950.9
1291	747550	2082200	5948.5
1292	747550	2082250	5946.1
1293	747550	2082300	5941.7
1294	747500	2081550	5951.3
1295	747500	2081600	5950.8
1296	747500	2081650	5950.2
1297	747500	2081700	5949.5
1298	747500	2081750	5948.9
1299	747500	2081800	5948.2
1300	747500	2081850	5947.5
1301	747500	2081900	5946.9
1302	747500	2081950	5946.2
1303	747500	2082000	5944.5
1304	747500	2082050	5942.7
1305	747500	2082100	5940.8
1306	747500	2082150	5939
1307	747500	2082200	5935

*NOTE: SEE FLATIRONS SURVEYING RECORD DRAWING FOR FINAL ELEVATIONS.

FINAL COPY

ISSUE								CLASS	PROJECT/CHARGE NO.
1	AS-BUILT DRAWING								
	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	RJ CHKD	RJ APVD			57378
0	ORIGINAL ISSUE								PROJECT/WCF NO. 020525

DESCRIPTION

KEYWORDS
1.
2.
3.
4.
5.
BLDG./FACILITY
ROOM/AREA
GRID COORD./COL NO.

TOLERANCES
FRACT. ±
ANGLE ±
DEC. ±
UNLESS NOTED OTHERWISE
REMOVE BURRS AND SHARP EDGES
NEXT ASSEMBLY
SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH		
DESIGNED BY		
R. THOMPSON	RJ	5/12/05
DRAWN BY		
A. SMOTHERMON	AS	5/12/05
CHECKED BY		
R. ARCHIBALD	RA	5/12/05
INDEPENDENT VERIFIER		
S. LAWRENCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	RJ	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

DESIGN TOP OF SUBGRADE TWO FINAL CONTOURS ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-006	1

L:\GROUP\CAD\ROCKY_FLATS\Olf_2005\Regrades\RgPts1.dgn Date: 8-2005

QUAN.	DESCRIPTION	MATERIAL

COORDINATE COVER FILL ACTIVITIES WITH RAILROAD LOADING ACTIVITIES

2" COVER-SOIL TYP SEE DETAIL

GRADE TO DRAIN

GRADE TO DRAIN

GRADE TO DRAIN

SEE FLATIRONS SURVEYING RECORD DRAWINGS FOR ACTUAL FINAL COVER ELEVATIONS

LEGEND

- LIMIT OF FINAL COVER
- APPROXIMATE LIMIT OF WASTE
- 10 FOOT CONTOUR
- 2 FOOT CONTOUR
- IN 40000 E 20000 GRID COORDINATE SYSTEM
- GRAVEL ROAD

0' 60 120'

FINAL COPY

2 ISSUE	AS-BUILT DRAWING									
	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	RT CHKD	RA IY	RT APVD		CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE									
	DESCRIPTION									PROJECT/WCF NO. 020525

KEYWORDS

1.
2.
3.
4.
5.
BLDG./FACILITY
ROOM/AREA
GRID COORD./COL NO.

TOLERANCES
FRACT. ±
ANGLE
DEC. ±
UNLESS NOTED OTHERWISE
REMOVE BURRS AND SHARP EDGES
NEXT ASSEMBLY
SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH		
DESIGNED BY		
R. THOMPSON	RT	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. ARCHIBALO	RA	5/12/05
INDEPENDENT VERIFIER		
S. LAWERNCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	RT	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

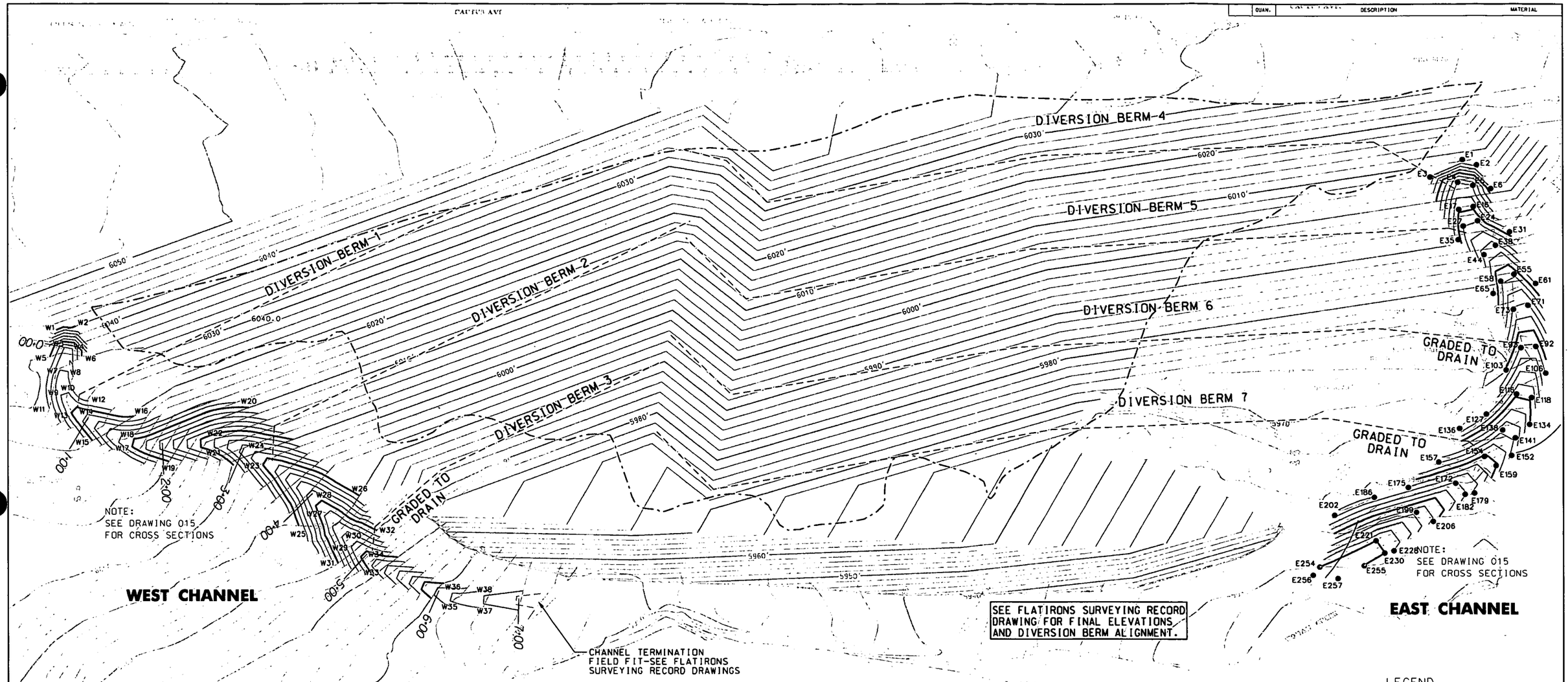
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

DESIGN TOP OF FINAL COVER CONTOURS
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-007	2

L:\GROUP\CAD\ROCKY_FLATS\Olf_2005\FinalGrds\FGGBcvr1.dgn Date: 8-2005

	QUAN.	DESCRIPTION	MATERIAL



CONSTRUCTION CONTROL POINTS WEST CHANNEL

POINT NUMBER	NORTH COORDINATE	EAST COORDINATE	DESIGN ELEVATION
W1	747796.3	2080845.4	6040.0
W2	747800.9	2080868.5	6040.0
W3	747774.9	2080854.6	6026.0
W4	747773.0	2080864.4	6026.0
W5	747763.4	2080837.0	6030.0
W6	747763.8	2080876.3	6030.0
W7	747746.8	2080849.2	6024.0
W8	747745.0	2080859.0	6024.0
W9	747716.2	2080850.2	6022.0
W10	747719.2	2080859.7	6022.0
W11	747699.8	2080835.7	6028.0
W12	747709.0	2080883.0	6024.0
W13	747694.6	2080863.1	6020.0
W14	747701.5	2080870.4	6020.0
W15	747660.2	2080889.2	6020.0
W16	747690.0	2080939.9	6020.0
W17	747652.7	2080937.7	6010.0
W18	747662.4	2080940.0	6010.0
W19	747634.7	2080982.9	6010.0
W20	747700.6	2081080.3	6010.0
W21	747652.2	2081038.4	5998.0

CONSTRUCTION CONTROL POINTS WEST CHANNEL

POINT NUMBER	NORTH COORDINATE	EAST COORDINATE	DESIGN ELEVATION
W22	747662.2	2081038.8	5998.0
W23	747638.5	2081083.4	5992.0
W24	747647.1	2081088.4	5992.0
W25	747555.6	2081141.0	5990.0
W26	747592.2	2081215.8	5990.0
W27	747580.2	2081161.9	5980.0
W28	747586.7	2081169.5	5980.0
W29	747529.6	2081205.5	5972.0
W30	747536.5	2081212.8	5972.0
W31	747509.6	2081189.7	5980.0
W32	747549.7	2081237.0	5980.0
W33	747506.4	2081230.7	5968.0
W34	747514.6	2081236.4	5968.0
W35	747463.4	2081326.9	5956.0
W36	747473.1	2081329.4	5956.0
W37	747459.8	2081367.8	5954.0
W38	747469.8	2081368.0	5954.0

CONSTRUCTION CONTROL POINTS EAST CHANNEL

POINT NUMBER	NORTH COORDINATE	EAST COORDINATE	DESIGN ELEVATION
E1	748005.4	2082561	6008.4
E2	747998.9	2082578.1	6006.8
E3	747983.6	2082521.7	6005.6
E4	747977.2	2082555.7	5994.1
E5	747973.9	2082573.4	5994.1
E6	747970	2082594.4	6001.2
E16	747947.7	2082574	5990.5
E17	747943.9	2082556.4	5990.5
E24	747929.8	2082578.9	5988.1
E27	747923.2	2082562.2	5988.1
E31	747915.9	2082617.8	5991.1
E35	747907	2082556.2	5991
E38	747900.2	2082600.3	5983.3
E44	747888.1	2082586.9	5983.3
E55	747864.6	2082622.7	5978.5
E58	747856.3	2082606.8	5978.5
E61	747853.2	2082648.5	5982.1
E65	747840.9	2082597.8	5982.3
E71	747826.4	2082639.1	5973.7
E73	747821	2082622	5973.7
E92	747775.2	2082648.6	5967.7
E93	747774.2	2082630.6	5967.7
E103	747747.2	2082613	5969.8
E106	747742.8	2082659.9	5968
E116	747717.4	2082625.4	5960.5

CONSTRUCTION CONTROL POINTS EAST CHANNEL

POINT NUMBER	NORTH COORDINATE	EAST COORDINATE	DESIGN ELEVATION
E127	747692.6	2082589.1	5964.3
E134	747680.2	2082640.6	5959.6
E136	747675.4	2082557.4	5965.7
E138	747672.9	2082608.3	5954.5
E141	747664.4	2082624.2	5954.5
E152	747642.3	2082619.6	5954.6
E154	747641.3	2082587	5949.7
E157	747634.1	2082531.9	5954.5
E159	747629.8	2082600.9	5949.7
E172	747608.4	2082552	5943.7
E175	747603	2082494.5	5947.8
E179	747596.3	2082574.3	5946.6
E182	747594.3	2082563.2	5943.7
E186	747590.3	2082441.8	5948.7
E199	747572.6	2082504.4	5936.5
E202	747568.8	2082405.9	5946.7
E206	747561.2	2082525	5938.8
E221	747537.5	2082456.1	5930
E228	747525.3	2082477	5931.8
E230	747522.5	2082466.2	5930
E254	747505.2	2082387.9	
E255	747506.7	2082441.7	
E256	747495.4	2082380.1	
E257	747491.4	2082410.1	

LEGEND

- DIVERSION BERM
- CONTROL POINT
- LIMIT OF WASTE
- 6+00 STATION NUMBER

FINAL COPY

AS-BUILT DRAWING

REVISION DESCRIPTION

3 ISSUE	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	RJ CHKD	RA IV	RJ APVD		CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE									

DESCRIPTION

KEYWORDS

1.
2.
3.
4.
5.

BLDG./FACILITY

ROOM/AREA

GRID COORD./COL NO.

TOLERANCES
FRACT. ±
ANGLE
DEC. .
UNLESS NOTED OTHERWISE

REMOVE BURRS AND SHARP EDGES

NEXT ASSEMBLY

SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH

DESIGNED BY		
R. ARCHIBALD	RA	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. THOMPSON	RJ	5/12/05
INDEPENDENT VERIFIER		
S. LAWERNCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	RJ	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

DESIGN CHANNELS
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

PROJECT/WCF NO. 020525

SIZE	DRAWING NUMBER	ISSUE
B	51788-008	3

L:\GROUP\CAD\ROCKY_FLATS\Olf_2005\SurfWater\DivrCpts1.dgn Date: 8-2005

QUAN.	DESCRIPTION	MATERIAL

DIVERSION BERMS 1,2,3,4,5,6,7
SLOPE: 2% AVE. & 3rd AVE.
SHAPE: TRIANGULAR
HEIGHT: 3 FEET
PERMANENT LINING: GRASS
TEMPORARY LINING: C125 AND C125BN EROSION MAT-
SEE FLATIRONS SURVEYING RECORD DRAWINGS

EAST CHANNEL
SLOPE: 12%
SHAPE: TRAPEZOIDAL-18 FOOT BOTTOM
SIDESLOPES: 3:1 TO 4:1
MINIMUM DEPTH: 2 FEET
PERMANENT LINING: NAG P550

WEST CHANNEL
SLOPE: 12%
SHAPE: TRAPEZOIDAL-10 FOOT BOTTOM
SIDESLOPES: 3:1
MINIMUM DEPTH: 2 FEET
PERMANENT LINING:
NAG P550

CACTUS AVE. & 1st AVE.
CACTUS AVE. & 2nd AVE.
CACTUS AVE.
DIRT ROAD
STORM INLET
BEGIN CHANNEL
EAST SUBSURFACE DRAIN
DIVERSION BERM 1
DIVERSION BERM 2
DIVERSION BERM 3
DIVERSION BERM 4
DIVERSION BERM 5
DIVERSION BERM 6
DIVERSION BERM 7
DIVERSION BERM AT RIDGE LINE (TYP)
DOWNSLOPE CHANNEL (TYP)
SEEP #4
SEEP #7
SEEP DRAINS
GRADED TO DRAIN
SURFACE WATER DITCH
DITCH
WOMAN CREEK
AREAS OVEREXCAVATED AND REPLACED WITH DRAIN RIPRAP (NORTH) AND ROCKY FLATS ALLUVIUM (SOUTH)- SEE FLATIRONS SURVEYING RECORD DRAWINGS
SMALL DEPRESSED AREA CONSTRUCTED
END CHANNEL
SEE FLATIRONS SURVEYING RECORD DRAWINGS FOR FINAL ELEVATIONS AND DIVERSION BERM ALIGNMENT.
AREA REGRADED IN THE FIELD TO APPROXIMATELY 4:1 SLOPE TO ASSURE SIDESLOPE STABILITY.

LEGEND
---- DIVERSION BERM
CHANNEL
---- LIMIT OF WASTE

N
0' 60 120'

FINAL COPY

3 ISSUE	AS-BUILT DRAWING	REVISION DESCRIPTION							
	EARTH TECH DESIGN COMPANY	11/30/05 DATE	SP DSGN	DB DWN	RJ CHKD	RA IV	RJ APVD	CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE	DESCRIPTION							PROJECT/WCF NO. 020525

KEYWORDS
1.
2.
3.
4.
5.
BLDG./FACILITY
ROOM/AREA
GRID COORD./COL NO.

TOLERANCES
FRACT. ±
ANGLE
DEC. ±
UNLESS NOTED OTHERWISE
REMOVE BURRS AND SHARP EDGES
NEXT ASSEMBLY
SCALE: AS SHOWN

DESIGN COMPANY: E A R T H T E C H

DESIGNED BY		
R. ARCHIBALD	RA	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. THOMPSON	RJT	5/12/05
INDEPENDENT VERIFIER		
S. LAWRENCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	RJT	5/12/05
CLASSIFIER		

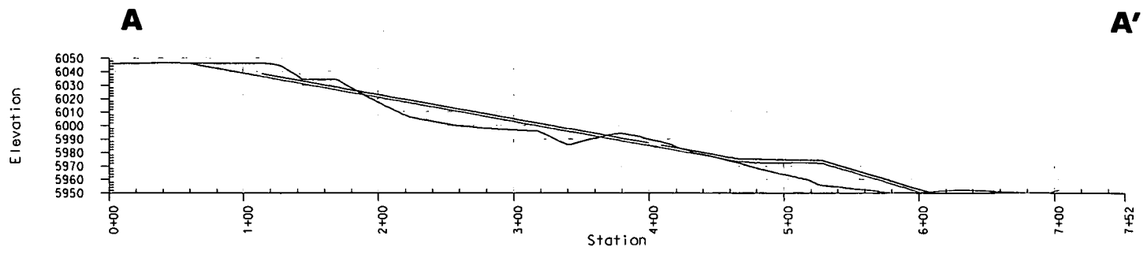
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

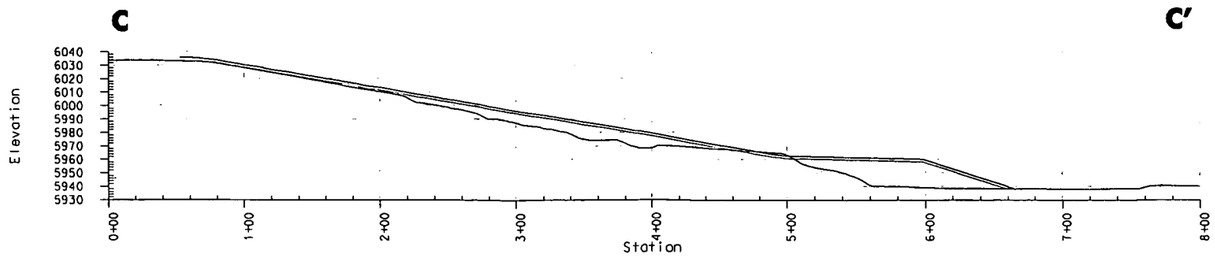
SURFACE WATER MANAGEMENT PLAN
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

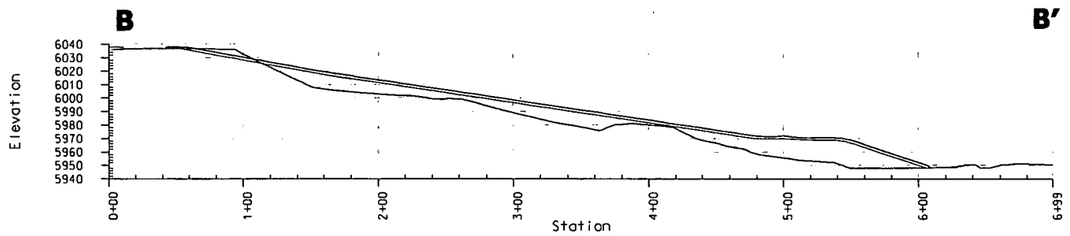
SIZE	DRAWING NUMBER	ISSUE
B	51788-009	3

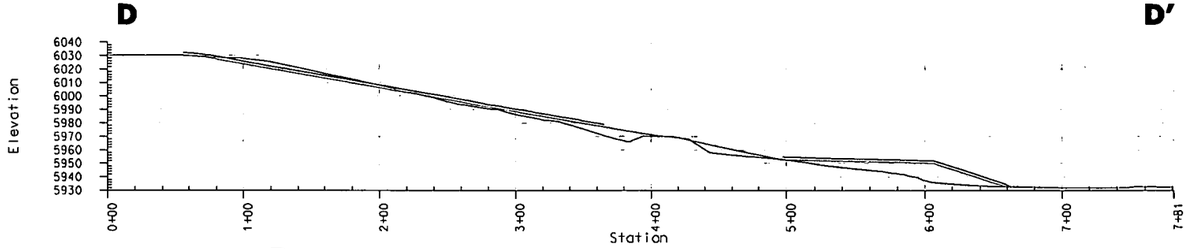
L:\GROUP\CAD\ROCKY_FLATS\Olf_2005\SurfWater\SurfREV2.dgn Date: 8-24-2005

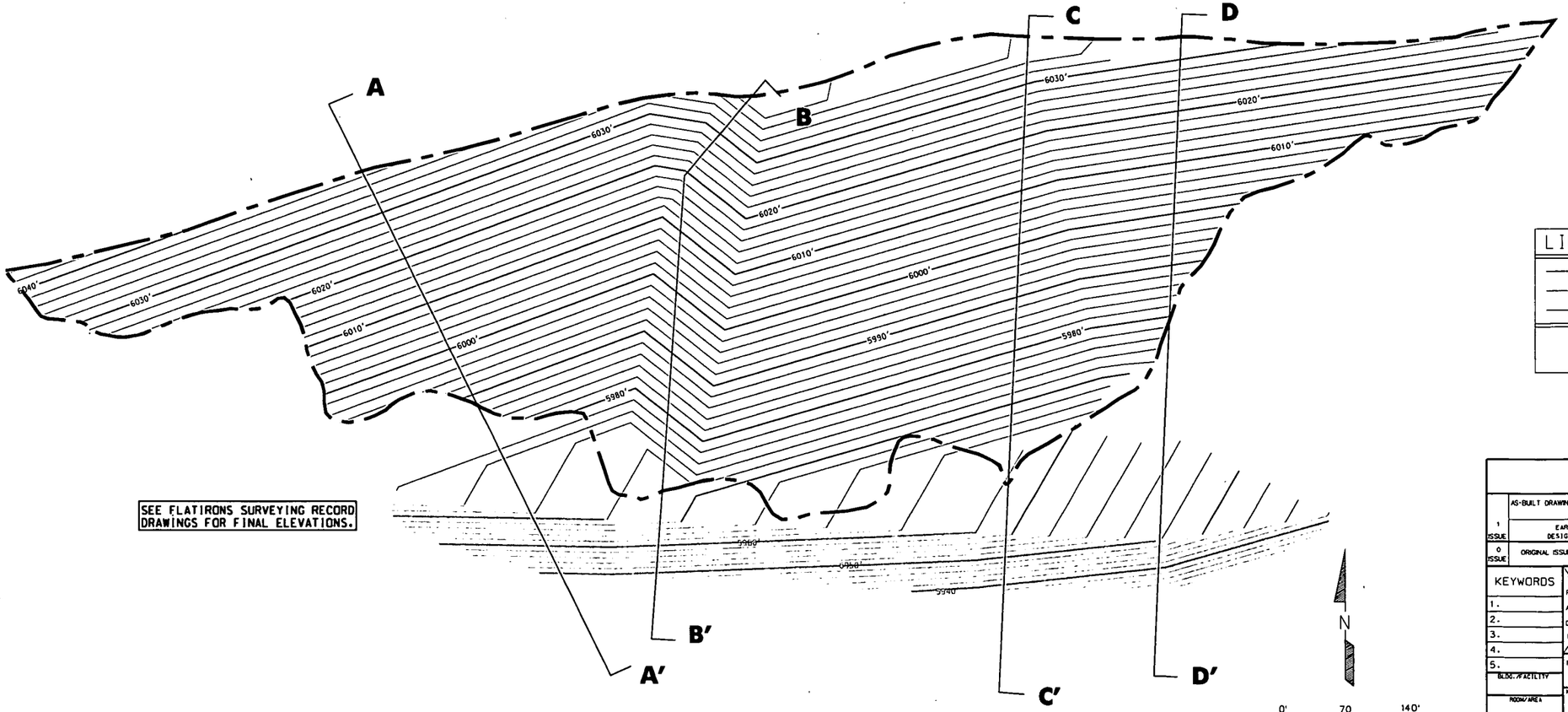
QUAN.	DESCRIPTION	MATERIAL











SEE FLATIRONS SURVEYING RECORD DRAWINGS FOR FINAL ELEVATIONS.

LINE	SURFACE	OFFSET
———	Final Grades	
———	Regrades	
———	Existing Surface	
Scaled 1.00 Times Ver. Scaled 1.00 Times Hor.		

FINAL COPY

1 ISSUE	AS-BUILT DRAWING										
	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	RJ CHKD	RA IV	RJ APVD			CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE	DESCRIPTION									PROJECT/WCF NO. 020525

KEYWORDS
1.
2.
3.
4.
5.
BLDG./FACILITY
ROOM/AREA
GRID COORD./COL. NO.

TOLERANCES
FRACT. ±
ANGLE ±
DEC. ±
UNLESS NOTED OTHERWISE
REMOVE BURRS AND SHARP EDGES
NEXT ASSEMBLY
SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH
DESIGNED BY
R. THOMPSON — RJ — 5/12/05
DRAWN BY
A. SHOTNIK — AS — 5/12/05
CHECKED BY
R. ARCHIBALD — RA — 5/12/05
S. LAWERNCE — SL — 5/12/05
APPROVED BY
R. THOMPSON — RJ — 5/12/05
CLASSIFIER

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

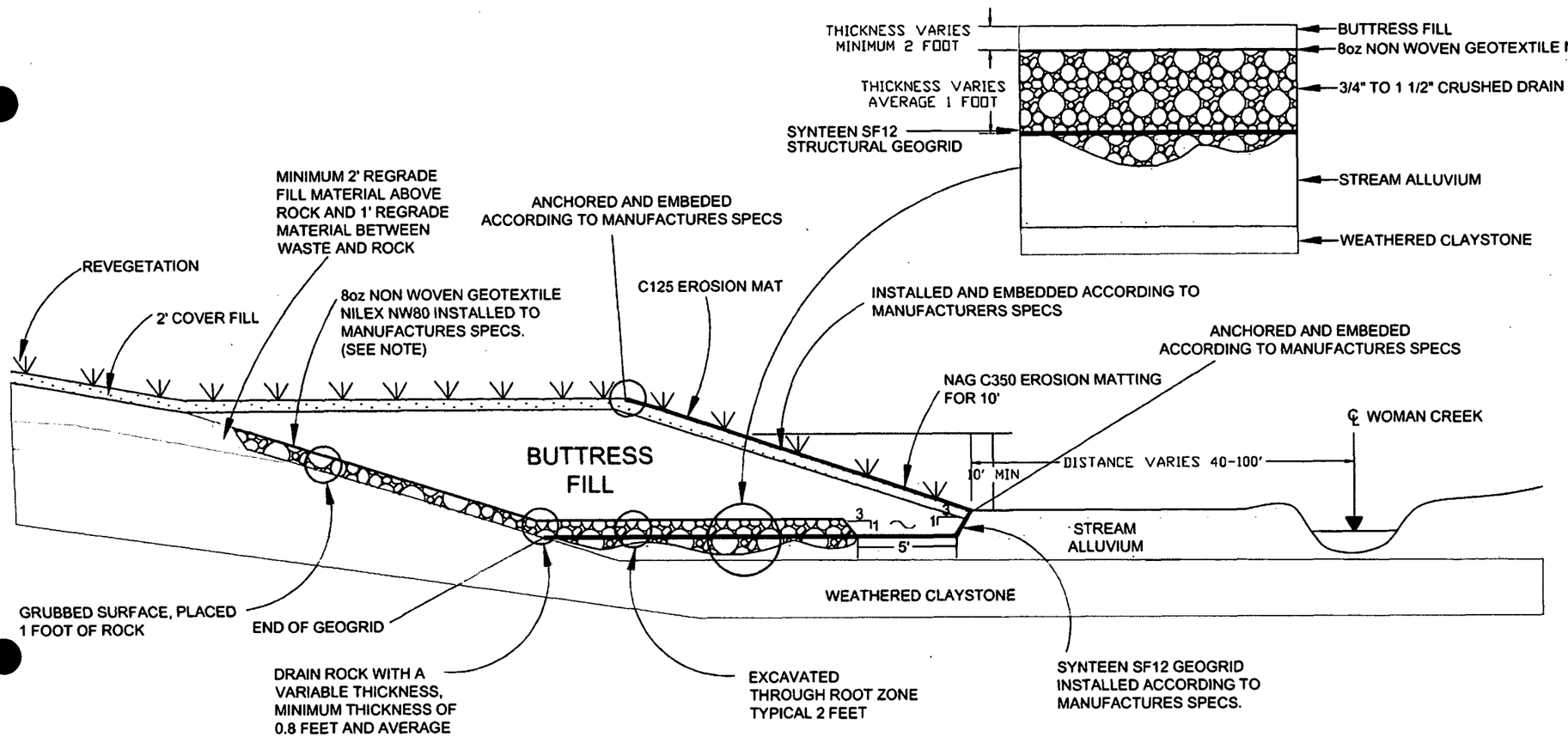
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

LANDFILL WIDE CROSS SECTIONS
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

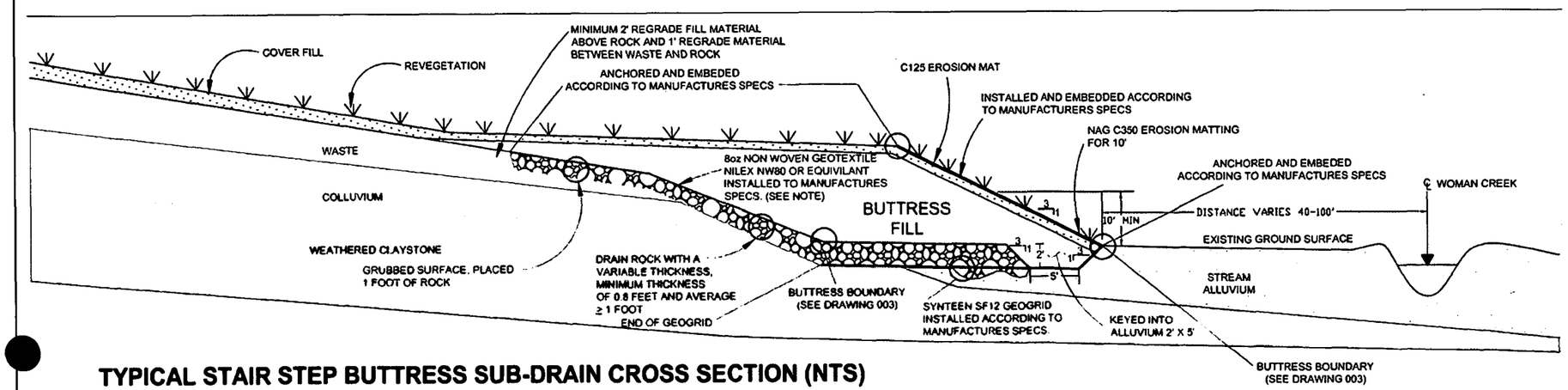
SIZE	DRAWING NUMBER	ISSUE
B	51788-010	1

L:\GROUP\CAD\ROCKY_FLATS\Olf_2005\Xsects\XsecFG1.dgn Date: 8-2005

QUAN.	DESCRIPTION	MATERIAL



TYPICAL SLOPED BUTTRESS SUB-DRAIN CROSS SECTION B (NTS)



TYPICAL STAIR STEP BUTTRESS SUB-DRAIN CROSS SECTION (NTS)

KEY	MATERIAL DESIGNATION	DESCRIPTION
	(1a)	WASTE
	(2)	COLLUVIUM / SLIDE
	(3)	ROCKY FLATS ALLUVIUM
	(4)	STREAM ALLUVIUM
	(5)	WEATHERED CLAYSTONE
	(6)	UNWEATHERED CLAYSTONE
	(7)	ENGINEERED FILL

NOTE:
GEOTEXTILE INSTALLED IN A 6 INCH BY 6 INCH ANCHOR TRENCH AT TOP SLOPE AND EXTENEDED 5 FEET PAST DRAIN ROCK ON SIDES AND AT BOTTOM WAS ANCHORED UNDER DRAIN ROCK.

FINAL COPY

	AS-BUILT DRAWING								
	REVISION DESCRIPTION								
2 ISSUE	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	MJ CHKD	RA IV	MJ APVD		57378 CLASS PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE								

PROJECT/WCF NO. 020525

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

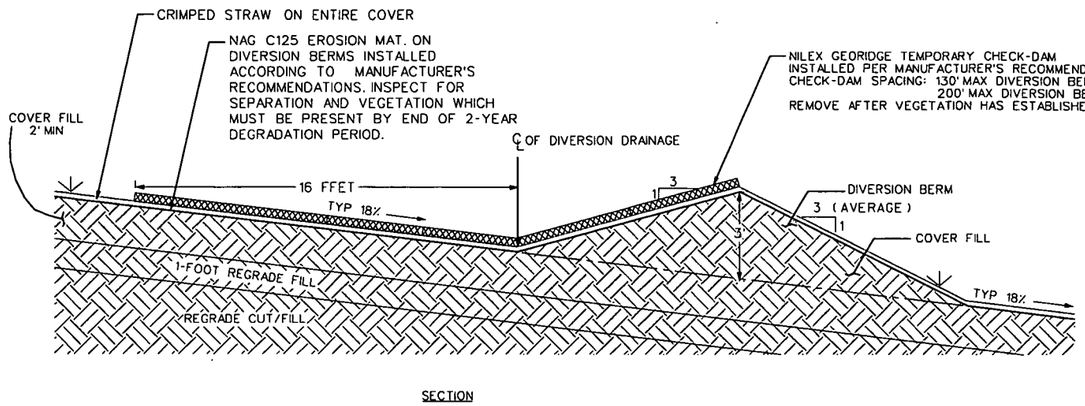
LANDFILL COVER DETAILS
BUTTRESS CONSTRUCTION

ORIGINAL LANDFILL
ACCELERATED ACTION

KEYWORDS	TOLERANCES	DESIGN COMPANY: EARTH TECH		
1.	FRACT.	DESIGNED BY		
2.	ANGLE	C. BOUDREAU	CB	5/12/05
3.	DEC.	DRAWN BY		
4.	UNLESS NOTED OTHERWISE	D. BAXTER	DB	5/12/05
5.	REMOVE BURRS AND SHARP EDGES	CHECKED BY		
BLDG./FACILITY SITE		R. THOMPSON	RT	5/12/05
	NEXT ASSEMBLY	INDEPENDENT VERIFIER		
ROOM/AREA NA	NA	S. LAWRENCE	SL	5/12/05
		APPROVED BY		
GRID COORD./COL NO. NA	SCALE: AS SHOWN	R. THOMPSON	RT	5/12/05
		CLASSIFER		

SIZE	DRAWING NUMBER	ISSUE
B	51788-011	2

L:\group\cad\rocky_flats\alf_2005\details\detail6.dgn 8/17/05



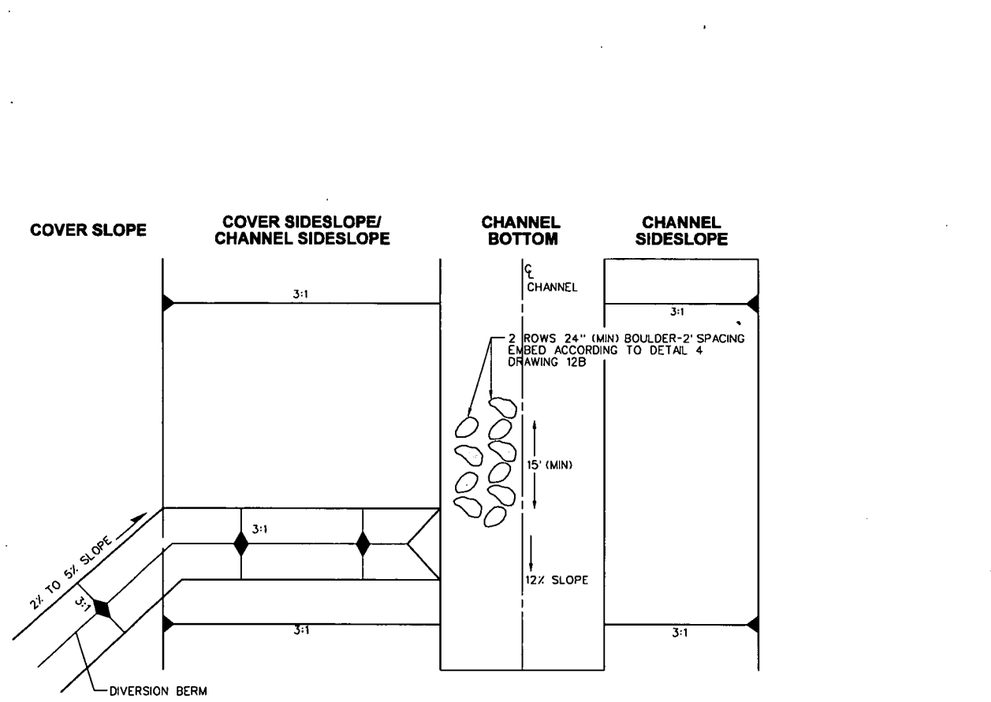
SECTION

NOTE: IN AREAS OUTSIDE OF THE WASTE "FOOTPRINT" COVER SOIL MAY BE LESS THAN 2' (IN TRANSITION AREAS) OR NO COVER SOIL

DIVERSION BERM (SECTION)

NTS

1 / 9 / 12A



PLAN VIEW

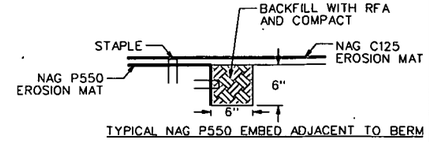
NOTE: NAG P550 EROSION MAT ON CHANNEL BOTTOM, CHANNEL SIDESLOPES, DOWNSLOPE CHANNEL BOTTOM, AND DOWNSLOPE CHANNEL SIDESLOPES. NAG C125 ON COVER SLOPE.

DOWNSLOPE CHANNEL TRANSITION FROM DIVERSION BERM TO CHANNEL (PLAN VIEW)

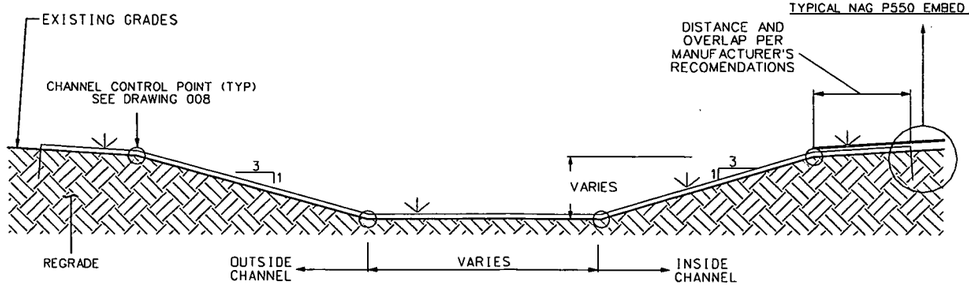
NTS

3 / 9 / 12A

QUAN.	DESCRIPTION	MATERIAL



TYPICAL NAG P550 EMBED ADJACENT TO BERM



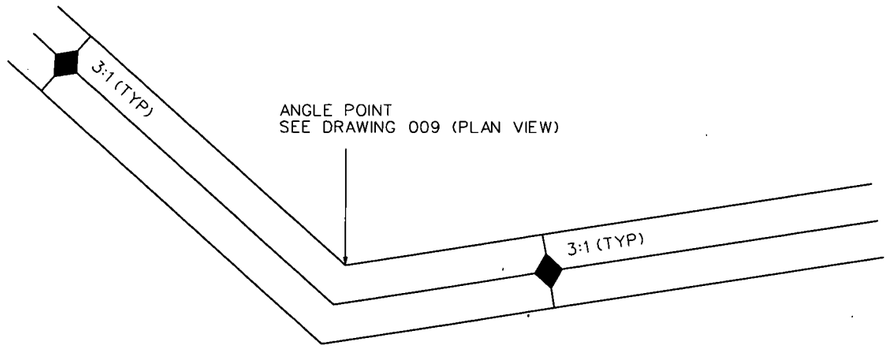
SECTION

NOTE: NAG P550 EROSION MAT ON CHANNEL BOTTOM AND ALL SIDESLOPES. INSTALL ACCORDING TO MANUFACTURER'S RECCOMENDATIONS.

PERMANENT/GRASS LINED CHANNEL DETAIL (SECTION)

NTS

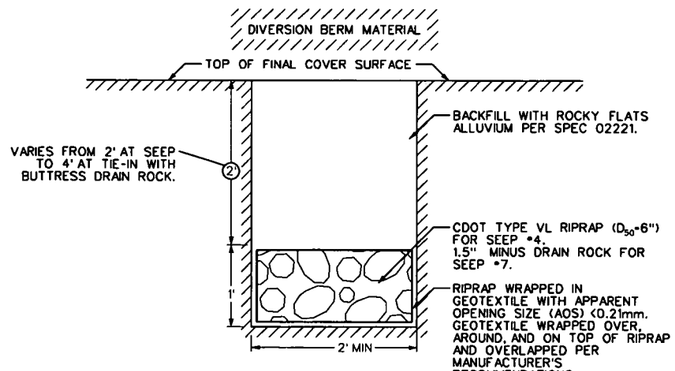
2 / 9 / 12A



DIVERSION BERM AT RIDGE LINE (PLAN VIEW)

NTS

4 / 9 / 12A



SEEP DRAIN CROSS-SECTION

NTS

5 / 9 / 12A

FINAL COPY

	AS-BUILT DRAWING	REVISION DESCRIPTION							
3 ISSUE	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	RJ CHKD	RJ IV	RJ APVD	CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE	DESCRIPTION							PROJECT/WCF NO. 020525

KEYWORDS

1.
2.
3.
4.
5.

BLDG./FACILITY SITE
NA
ROOM/AREA
NA
GRID COORD./COL NO.
NA

TOLERANCES
FRACT.
ANGLE
DEC. :
UNLESS NOTED OTHERWISE

REMOVE BURRS AND SHARP EDGES

NEXT ASSEMBLY
NA

SCALE:
AS SHOWN

DESIGNED BY		
R. ARCHBALD	RJ	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. THOMPSON	RJ	5/12/05
INDEPENDENT VERIFIER		
S. LAWRENCE	SJ	5/12/05
APPROVED BY		
R. THOMPSON	RJ	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

LANDFILL COVER DETAILS SURFACE WATER CONTROLS ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-012A	3

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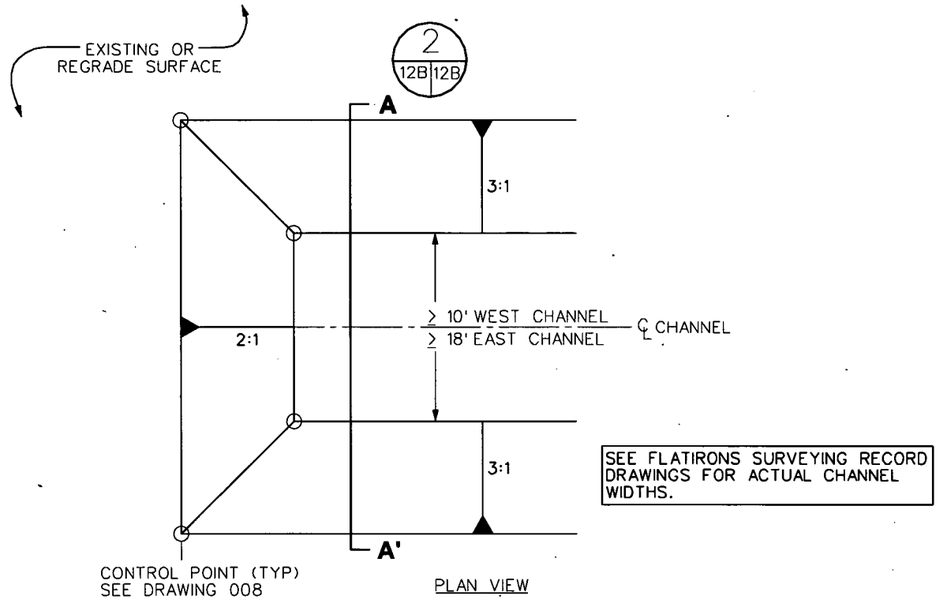
QUAN.	DESCRIPTION	MATERIAL

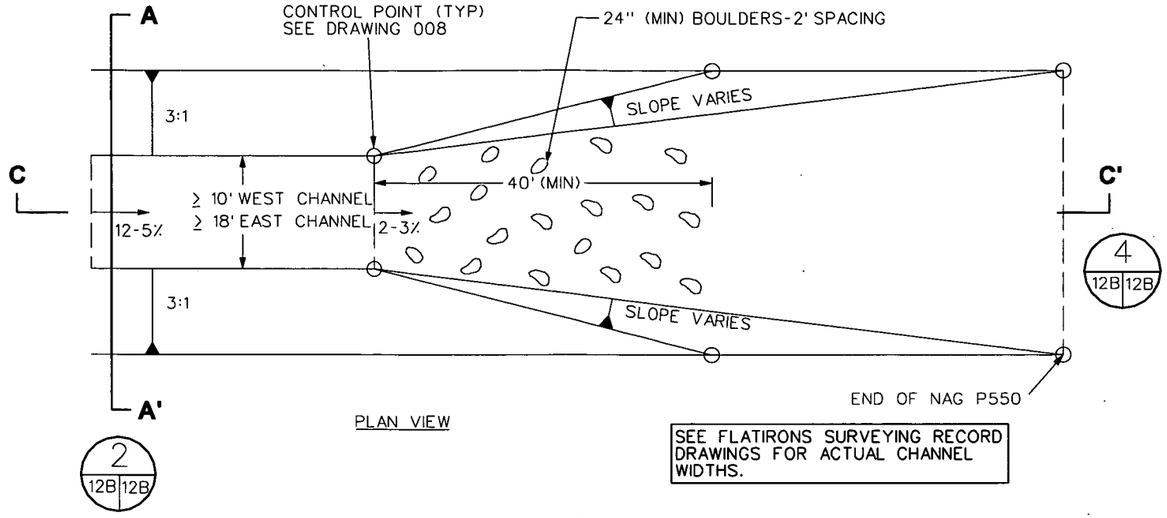


SEE FLATIRONS SURVEYING RECORD DRAWINGS FOR ACTUAL CHANNEL WIDTHS.

NOTES: NAG P550 EROSION MAT ON CHANNEL BOTTOM AND ALL SIDE SLOPES. INSTALL ACCORDING TO MANUFACTURER'S RECOMENDATIONS.

BEGIN CHANNEL (PLAN VIEW) — 1 / 9 | 12B

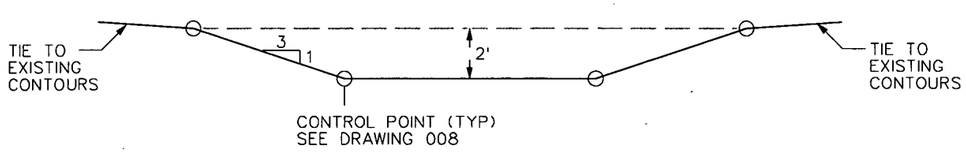
NTS



SEE FLATIRONS SURVEYING RECORD DRAWINGS FOR ACTUAL CHANNEL WIDTHS.

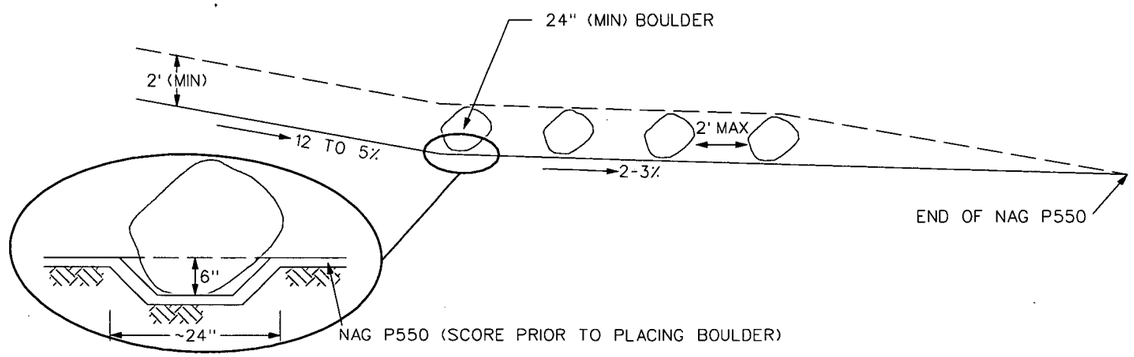
END CHANNEL (PLAN VIEW) — 3 / 9 | 12B

NTS



SECTION A-A' — 2 / 12B | 12B

NTS



SECTION C-C' — 4 / 12B | 12B

NTS

FINAL COPY

	AS-BUILT DRAWING	REVISION DESCRIPTION								
1 ISSUE	DESIGN COMPANY	9/21/05 DATE	SA DSGN	DB DWN	PJ CHKD	RA IV	PJ APVD		CLASS	51378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE	DESCRIPTION								PROJECT/WCF NO. 020525

KEYWORDS
1.
2.
3.
4.
5.
BLDG./FACILITY SITE
NA
ROOM/AREA
NA
GRID COORD./COL NO.
NA

TOLERANCES
FRACT.
ANGLE
DEC. :
UNLESS NOTED OTHERWISE
REMOVE BURRS AND SHARP EDGES
NEXT ASSEMBLY
NA
SCALE:
AS SHOWN

DESIGN COMPANY: EARTECH		
DESIGNED BY		
R. ARCHIBALD	PJ	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. THOMPSON	PJ	5/12/05
INDEPENDENT VERIFIER		
S. LAWRENCE	SA	5/12/05
APPROVED BY		
R. THOMPSON	PJ	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

LANDFILL COVER DETAILS SURFACE WATER CONTROLS
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-012B	1

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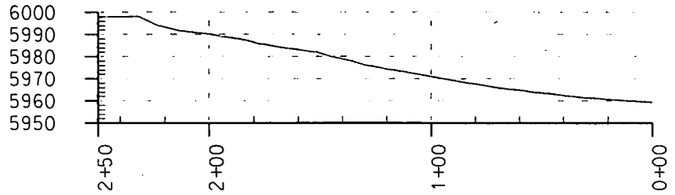
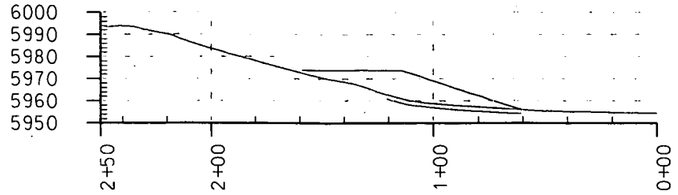
	QUAN.	DESCRIPTION	MATERIAL

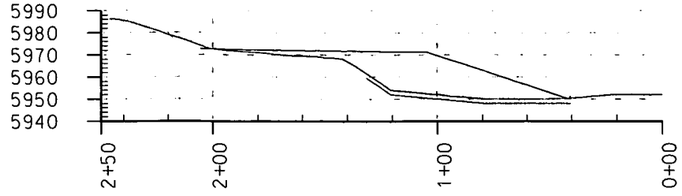
A - A'



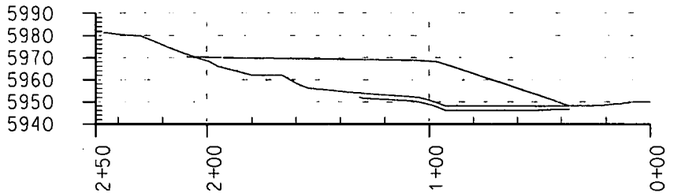
B - B'



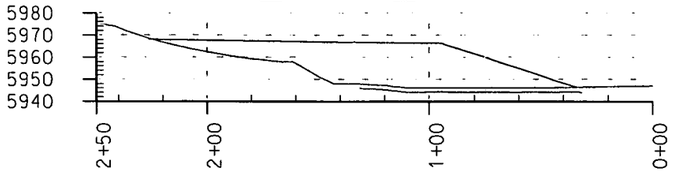
C - C'



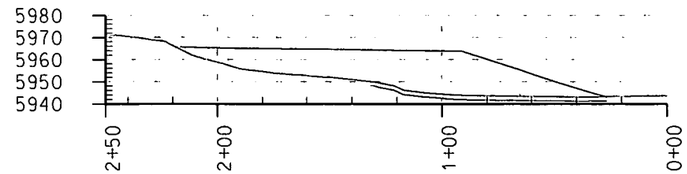
D - D'



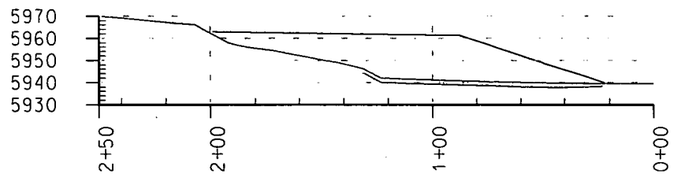
E - E'



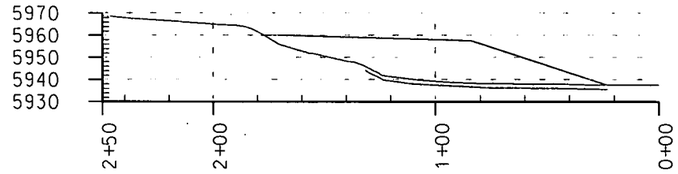
F - F'



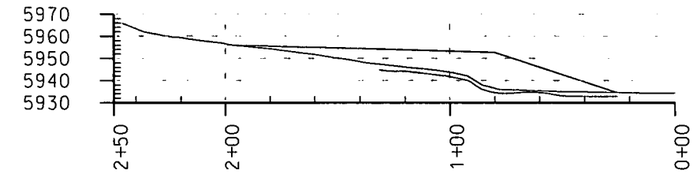
G - G'



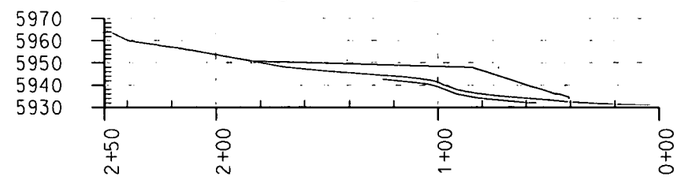
H - H'



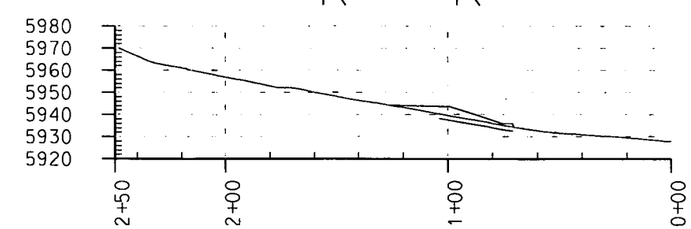
I - I'



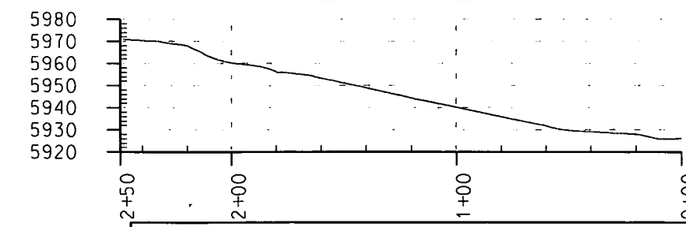
J - J'



K - K'



L - L'



SEE FLATIRONS SURVEYING RECORD DRAWINGS FOR FINAL ELEVATIONS.

LINE	SURFACE
———	Buttress
———	Existing Surface
———	Existing Surface Dropped 2ft

Scaled 1.00 Times Ver.
Scaled 1.00 Times Hor.

FINAL COPY

1 ISSUE	AS-BUILT DRAWING									
	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	RJ CHKD	RA IV	RJ APVD		CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE									

DESCRIPTION

PROJECT/WCF NO. 020525

KEYWORDS
1.
2.
3.
4.
5.
BLDG./FACILITY
ROOM/AREA
GRID COORD./COL. NO.

TOLERANCES
FRACT. ±
ANGLE ±
DEC. ±
UNLESS NOTED OTHERWISE
REMOVE BURRS AND SHARP EDGES
NEXT ASSEMBLY
SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH

DESIGNED BY		
R. THOMPSON	RJ	5/12/05
DRAWN BY		
A. SHOTWIK	AS	5/12/05
CHECKED BY		
R. ARCHIBALD	RA	5/12/05
INDEPENDENT VERIFIER		
S. LAWRENCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	RJ	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

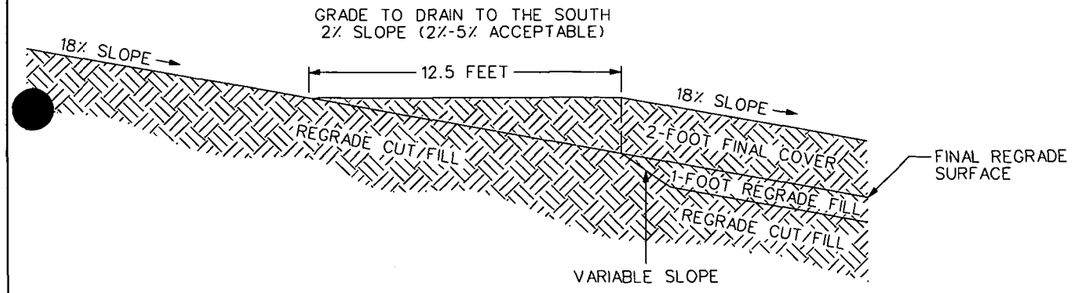
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

BUTTRESS CROSS SECTIONS
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-013	1

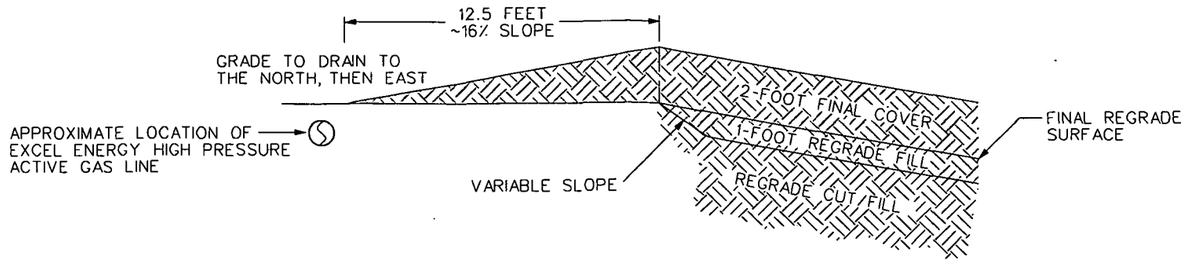
GROUP\CAD\ROCKY_FLATS\Olf_2005\Buttress\xsect013a.dgn Date: 8-2005

QUAN.	DESCRIPTION	MATERIAL



FINAL COVER TIE IN
18% FINAL COVER TO 18% REGRADE SURFACE UPSLOPE 1 (7 | 14)

NTS

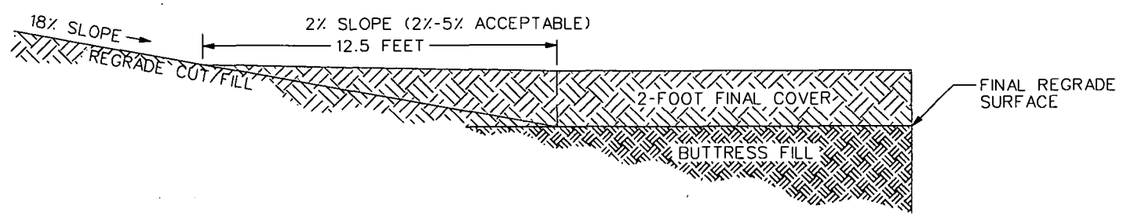


FINAL COVER TIE IN
18% FINAL COVER TO EXISTING CONDITION (NORTH SIDE) 2 (7 | 14)

NTS

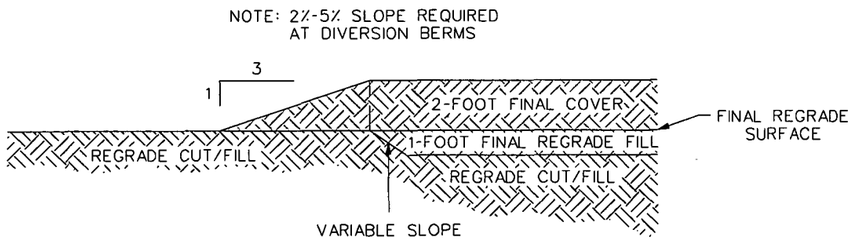
FINAL COVER TIE IN
BUTTRESS (LEVEL) SURFACE TO EXISTING CONDITIONS 3 (7 | 14)

NTS



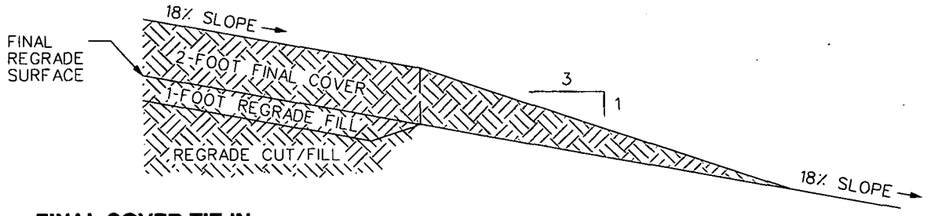
FINAL COVER TIE IN
BUTTRESS (LEVEL) SURFACE TO 18% REGRADE SURFACE 4 (7 | 14)

NTS



FINAL COVER TIE IN
18% FINAL COVER TO 18% REGRADE SURFACE
CROSS SLOPE (EAST AND WEST) 5 (7 | 14)

NTS



FINAL COVER TIE IN
18% FINAL COVER TO 18% REGRADE SURFACE DOWNSLOPE 6 (7 | 14)

NTS

FINAL COPY

	AS-BUILT DRAWING	REVISION DESCRIPTION									
1 ISSUE	DESIGN COMPANY	9/21/05 DATE	SP DSGN	SA DWN	#7 CHKD	#4 IV	#7 APVD			CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE	DESCRIPTION									PROJECT/WCF NO. 020525

KEYWORDS	TOLERANCES FRACT. ANGLE DEC. : UNLESS NOTED OTHERWISE	DESIGN COMPANY: E & T D Y N A		
1.		DESIGNED BY		
2.		R. THOMPSON	#7	5/12/05
3.		DRAWN BY		
4.		A. SHOTNER	AS	5/12/05
5.		CHECKED BY		
BLDG./FACILITY SITE	REMOVE BURRS AND SHARP EDGES	R. ARCHBALD	#4	5/12/05
		INDEPENDENT VERIFIER		
		S. LAWRENCE	SA	5/12/05
		APPROVED BY		
		R. THOMPSON	#7	5/12/05
ROOM/AREA NA	NEXT ASSEMBLY NA	CLASSIFIER		
GRID COORD./COL NO. NA	SCALE: AS SHOWN			

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

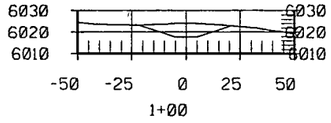
Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

FINAL COVER PERIMETER TIE IN DETAILS
ORIGINAL LANDFILL ACCELERATED ACTION DRAFT DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-014	1

L:\group\cad\rocky_flats\olf_2005\details\detail5a.dgn 8/18/05

QUAN.	DESCRIPTION	MATERIAL



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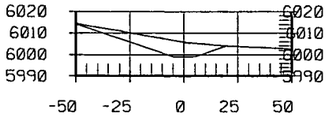

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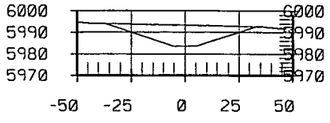

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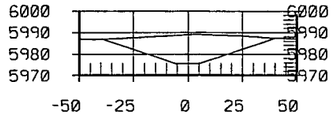

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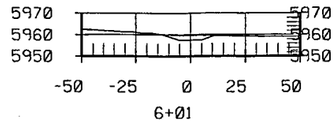

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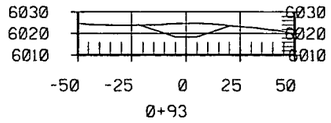

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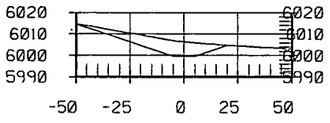

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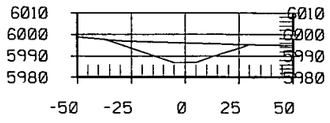

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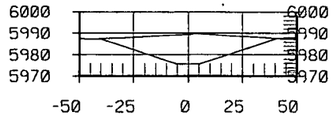

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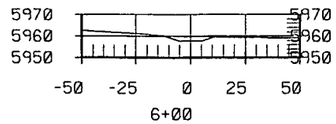

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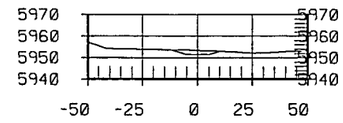

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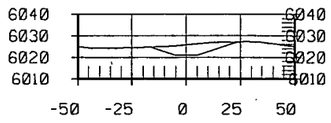

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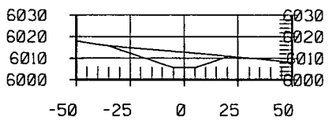

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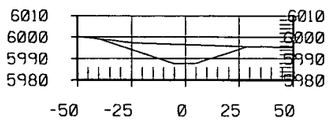

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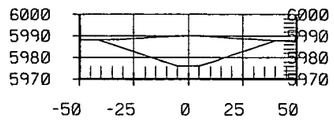

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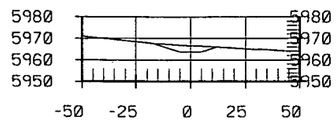

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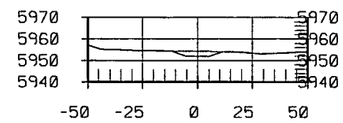

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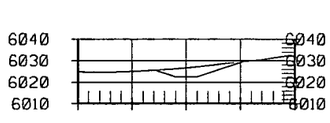

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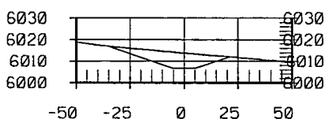

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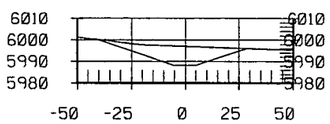

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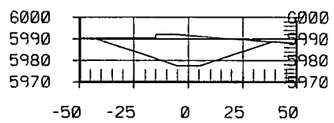

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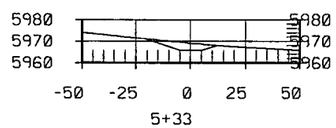

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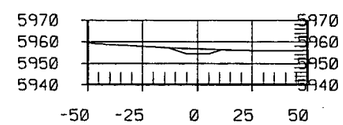

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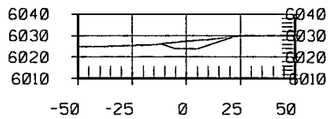

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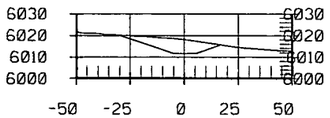

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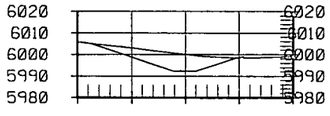

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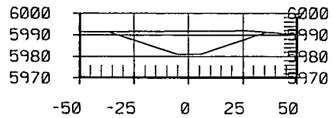

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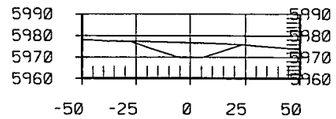

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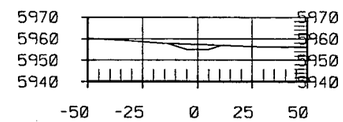

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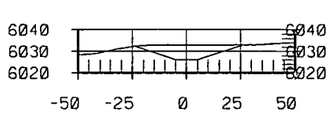

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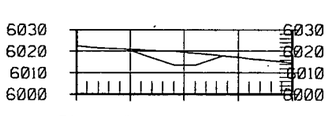

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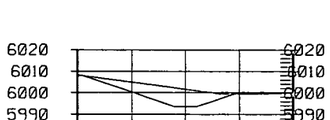

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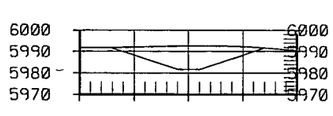

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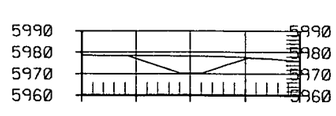

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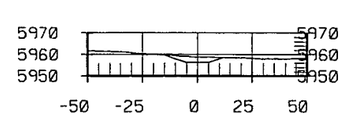


6+11

SEE FLATIRONS SURVEYING RECORD DRAWINGS FOR FINAL ELEVATIONS.

WEST CHANNEL

FINAL COPY

1 ISSUE	AS-BUILT DRAWING	REVISION DESCRIPTION								
	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	DB DWN	PJ CHKD	RA IV	PJ APVD		CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE	DESCRIPTION								PROJECT/WCF NO. 020525

KEYWORDS

1.

2.

3.

4.

5.

BLDG./FACILITY

ROOM/AREA

GRID COORD./COL. NO.

TOLERANCES
FRACT. ±
ANGLE ±
DEC. ±
UNLESS NOTED OTHERWISE

REMOVE BURRS AND SHARP EDGES

WELD ASSEMBLY

SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH		
DESIGNED BY		
R. THOMPSON	PJ	5/12/05
DRAWN BY		
A. SHOTNIK	AS	5/12/05
CHECKED BY		
R. ARCHBALD	RA	5/12/05
INDEPENDENT VERIFIER		
S. LAWRENCE	SL	5/12/05
APPROVED BY		
R. THOMPSON	PJ	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

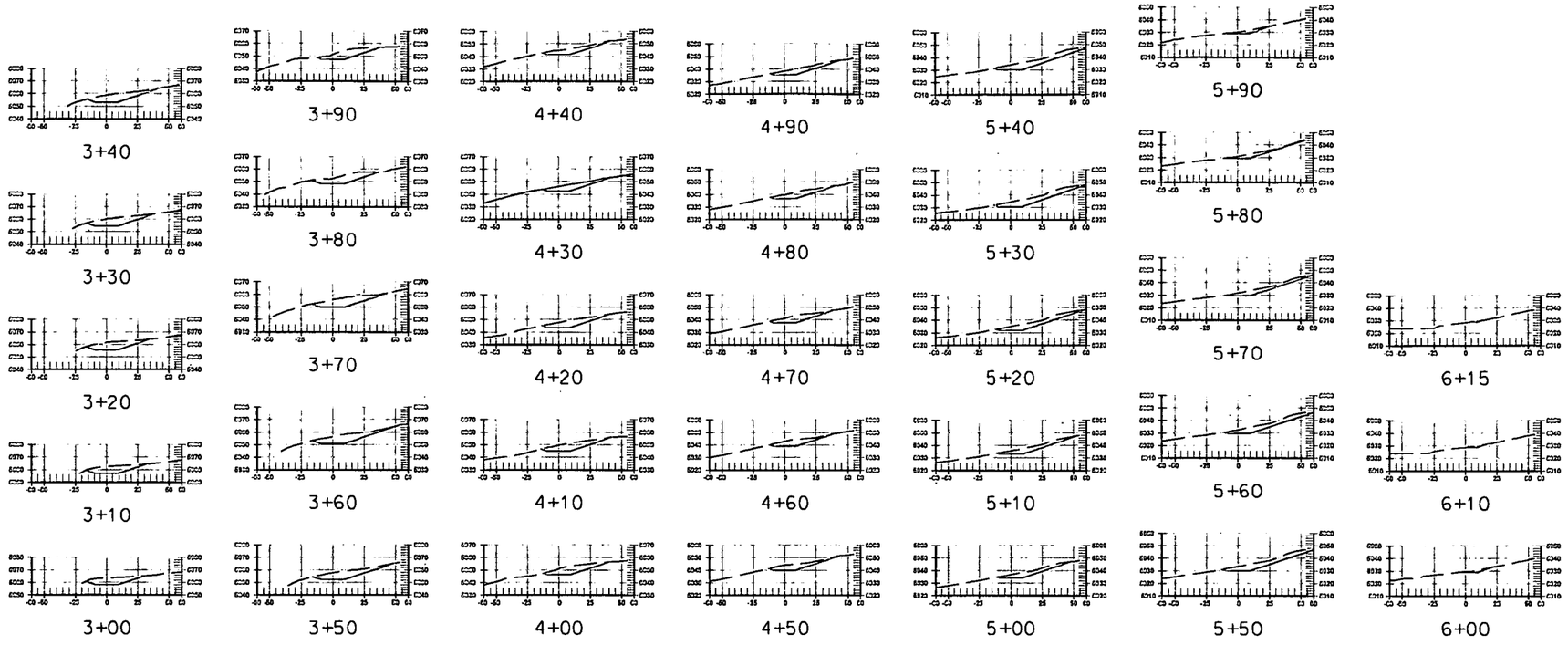
TYPICAL WEST CHANNEL CROSS SECTIONS
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

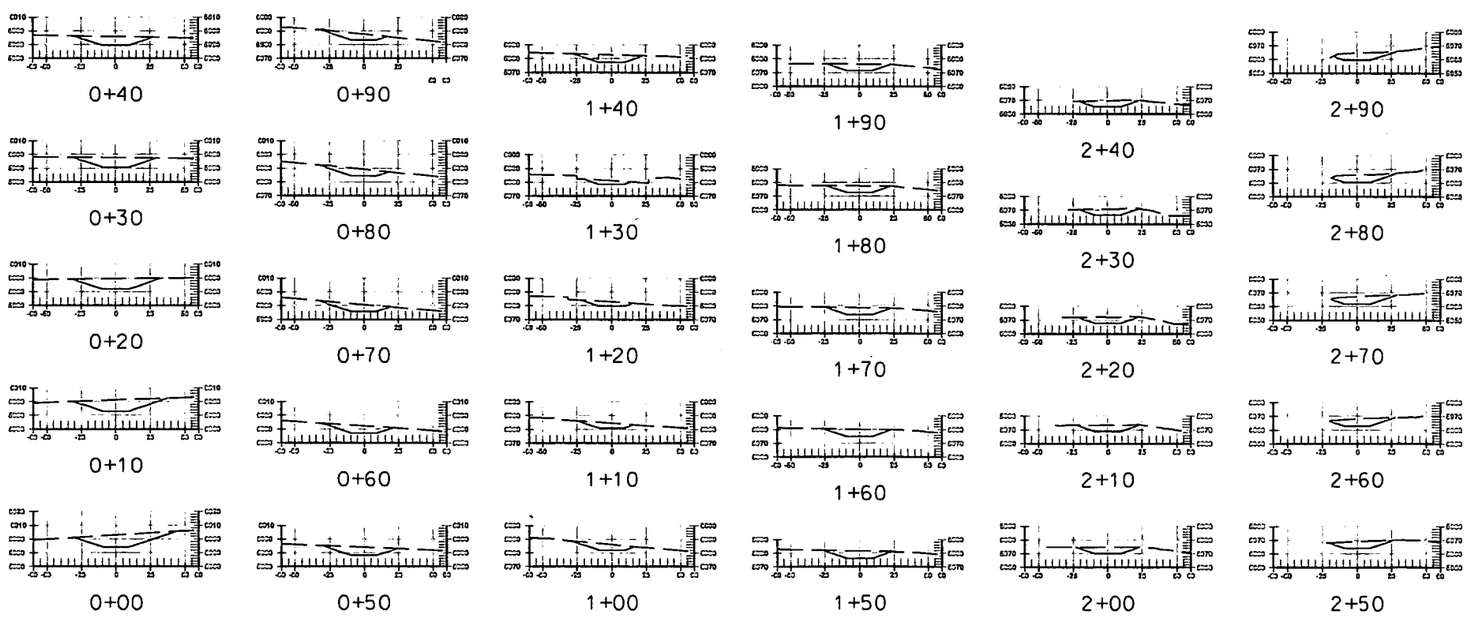
SIZE	DRAWING NUMBER	ISSUE
B	51788-015A	1

L:\GROUP\CAD\ROCKY_FLATS\Olf_2005\Channel\WChnl.dgn Date: 8-2005

QUAN.	DESCRIPTION	MATERIAL

SEE FLATIRONS SURVEYING RECORD DRAWINGS FOR FINAL ELEVATIONS.





EAST CHANNEL

FINAL COPY

1 ISSUE	AS-BUILT DRAWING — REVISION DESCRIPTION	EARTH TECH DESIGN COMPANY	9/21/05 DATE	SP DSGN	JB DRN	PJ CHKD	RJ IV	PJ APVD	CLASS	57378 PROJECT/CHARGE NO.
0 ISSUE	ORIGINAL ISSUE — DESCRIPTION									

PROJECT/WCF NO. 020525

KEYWORDS

1.
2.
3.
4.
5.

BLDG./FACILITY

ROOM/AREA

GRID COORD./COL NO.

TOLERANCES: FRACT. ±, ANGLE ±, DEC. ±, UNLESS NOTED OTHERWISE

REMOVE BURRS AND SHARP EDGES

NEXT ASSEMBLY

SCALE: AS SHOWN

DESIGN COMPANY: EARTH TECH

DESIGNED BY		
R. ARCHIBALD	RJ	5/12/05
DRAWN BY		
A. SHOTNK	JB	5/12/05
CHECKED BY		
R. THOMPSON	PJ	5/12/05
INDEPENDENT VERIFIER		
S. LAWRENCE	SJ	5/12/05
APPROVED BY		
R. THOMPSON	PJ	5/12/05
CLASSIFIER		

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

Rocky Flats Environmental Technology Site
GOLDEN, COLORADO

TYPICAL EAST CHANNEL CROSS SECTIONS

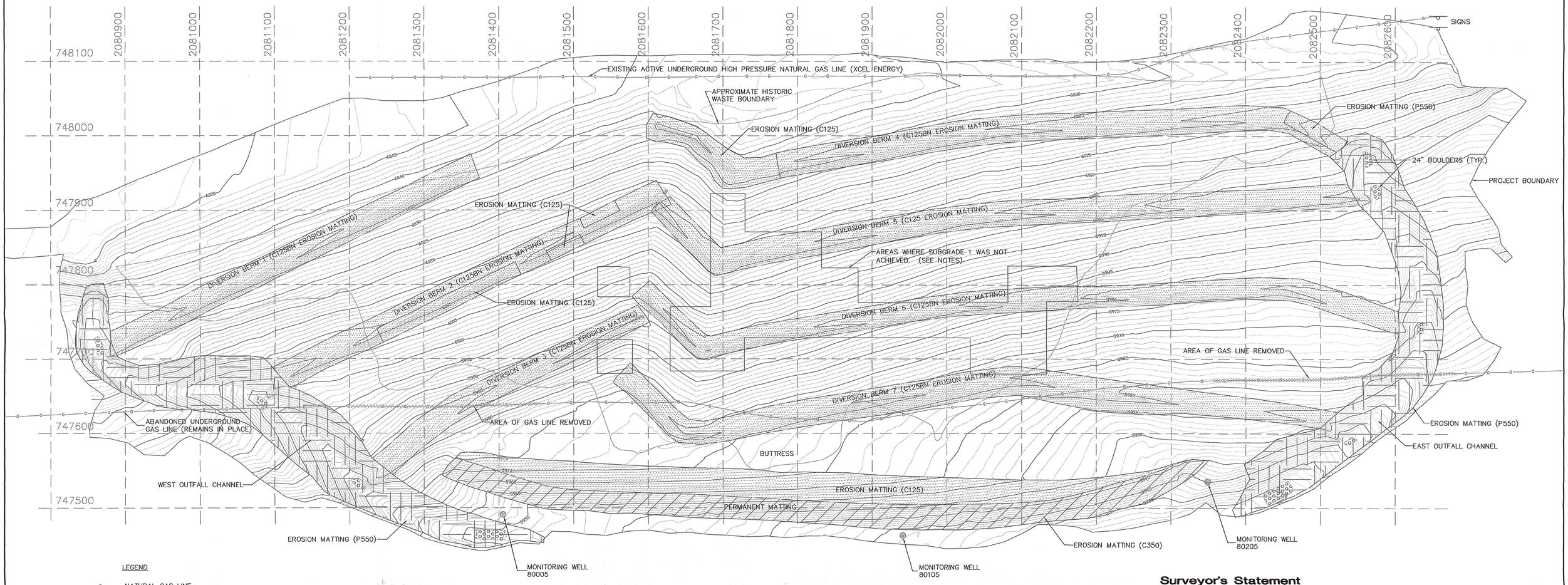
ORIGINAL LANDFILL ACCELERATED ACTION DESIGN

SIZE	DRAWING NUMBER	ISSUE
B	51788-015B	1

L:GROUP\CAD\ROCKY_FLATS\Olf_2005\Channel\EChnl.dgn Date: 8-2005

102

ORIGINAL LANDFILL
TOPOGRAPHIC SURVEY
SURVEYED 07/25/05 TO 9/08/05



LEGEND

- NATURAL GAS LINE
- APPROXIMATE WASTE BOUNDARY
- 5112 CONTOUR ELEVATION
- PROJECT BOUNDARY
- MONITORING WELL
- EROSION MATTING (C125BN)
- EROSION MATTING (C550)
- EROSION MATTING (C350)
- 24" BOULDERS

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

NOTES:

1) THE CONTOURS REPRESENTED HEREON WERE INTERPOLATED BY LAND DEVELOPMENT DESKTOP (DIGITAL TERRAIN MODELING) LDD 4 SOFTWARE BETWEEN ACTUAL MEASURED SPOT ELEVATIONS. DEPENDING ON THE DISTANCE FROM A MEASURED SPOT ELEVATION, THE CONTOUR SHOWN MAY NOT BE AN EXACT REPRESENTATION OF THE SITE TOPOGRAPHY. THE PURPOSE OF THIS TOPOGRAPHIC MAP IS FOR SITE EVALUATION AND TO SHOW SURFACE DRAINAGE FEATURES. ALL GRADES, ELEVATIONS AND CONTOURS WERE SURVEYED PRIOR TO 09/08/05.

2) ELECTRONIC DRAWING IS NOT A DESIGN GRADE TOPO.

3) THE BLUE OUTLINED AREAS INDICATE LOCATIONS WHERE SUBGRADE 1 WAS NOT ACHIEVED AS APPROVED BY KAISER–HILL COMPANY.

Surveyor's Statement

I, JOHN B. GUYTON, A DULY REGISTERED LAND SURVEYOR, LICENSED IN THE STATE OF COLORADO, HEREBY STATE FOR AND ON BEHALF OF FLATIRONS SURVEYING, INC., TO KAISER–HILL COMPANY, THAT THIS TOPOGRAPHIC EXHIBIT WAS PREPARED BY ME OR UNDER MY RESPONSIBLE CHARGE; THAT SAID EXHIBIT AND THE RELATIVE ELEVATIONS SHOWN HEREON ARE ACCURATE TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF.

JOHN B. GUYTON — COLORADO P.L.S. #16406 — PRESIDENT, FLATIRONS SURVEYING, INC.
DATE: NOVEMBER 23, 2005
FSI JOB NO. 04–43,872

LOCATION: ORIGINAL LANDFILL ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE	DRAWN BY: DPS	CHECKED BY: JJ, CMc
	SCALE: 1" = 60'	
	DATE: 09/21/05	
	JOB NUMBER	SHEET
DESCRIPTION: ASBUILT TOPOGRAPHIC SURVEY	43872	1 OF 1

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IA-A-002997)4)